SCIENTIFIC AMERICAN

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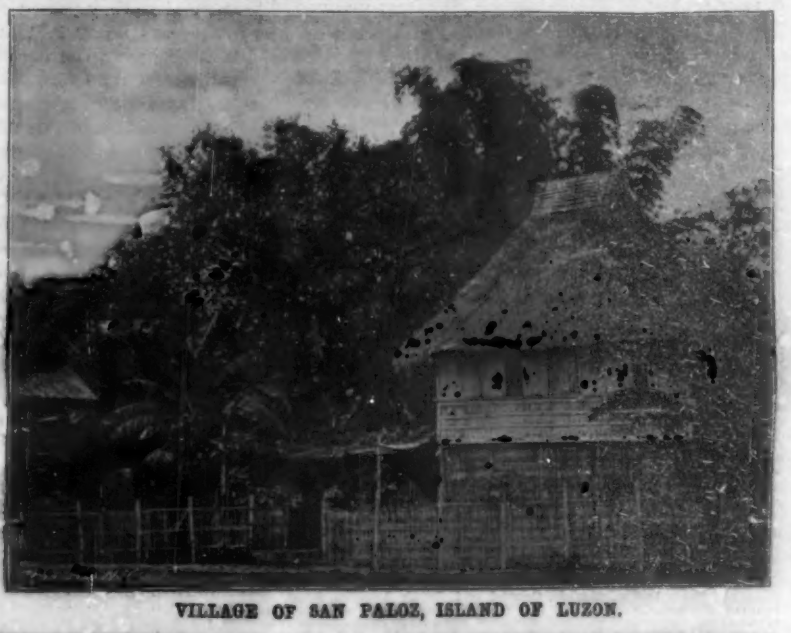
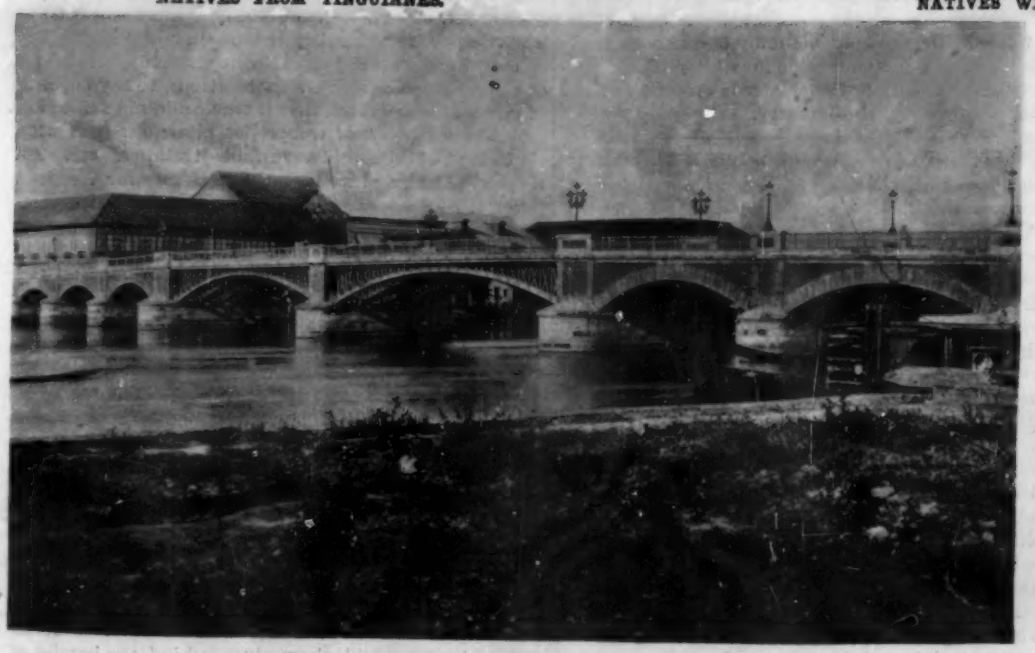
VILLAGE STREET IN CAMIGUIN



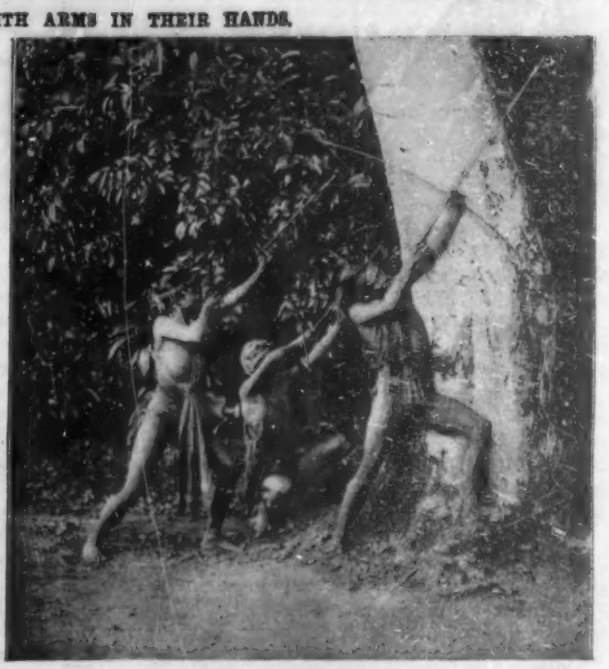
VILLAGE OF SAN PALOZ, ISLAND OF LUZON.

NATIVES FROM TINGUIANES.

NATIVES WITH ARMS IN THEIR HANDS.



PUENTE DE ESPAÑA, MANILA.



NATIVES HUNTING WITH BOWS.

THE PHILIPPINE ISLANDS AND THEIR INHABITANTS.—[See page 407.]

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OUR GREAT AGRICULTURAL SUPREMACY.

The farmers of the United States are now obtaining from other parts of the world more money for the fiscal year which ends with this month than in any preceding year in the history of the country. In 1892 American exports of agricultural products amounted to $799,323,212, but this will be surpassed by the record of the year which closes with the present month of June. The preliminary reports of the May exportations which have reached the Bureau of Statistics show that the agricultural exports will exceed $800,000,000, and the total may reach $835,000,000.

Never before have the exports of the agricultural products reached the $800,000,000 mark, and never but twice have they passed the $700,000,000 line, the fortunate years being 1881 and 1892. Compared with the last fiscal year, the increase in exports of agricultural products will be fully $130,000,000, and compared with the preceding year the increase will be over $250,000,000, while the total will be nearly fifty per cent in excess of that of the fiscal year 1895.

Naturally the export of breadstuffs takes the most prominent place, as they amount to nearly $1,000,000 for each business day, and the total will be more than $100,000,000 in excess of the last year's exports of breadstuffs. Of wheat the value of the exports of the fiscal year 1898 will be more than double that of the fiscal year 1897, while the increase in flour will be nearly fifty per cent and of corn nearly fifty per cent in value. Corn meal, oats and oatmeal and rye also show a striking increase. In provisions, by which are meant beef, hog and dairy products, the total exports are likely to reach $160,000,000—a considerable increase over last year.

Live beef is gaining greatly in popularity with the foreign customers and the exports have increased materially, while beef, either fresh, canned or salted, not only shows no increase, but in most cases there has been a falling off. The exportation of beef cattle during the first ten months of the fiscal year amounted to 379,663, against 310,478 in the corresponding months of last year, while fresh beef in the same period fell from 242,108,084 pounds in 1897 to 227,434,373 pounds in the corresponding ten months of 1898. Salted beef shows a falling off of about thirty-five per cent.

Agricultural products are by far the largest factor in the exports of this country, but the exports of the manufactured products have also increased, and the wonderfully favorable conditions of foreign trade during the past three years are perhaps not fully appreciated in their influence on the financial strength and general prosperity of the country.

For the year ending with June, 1896, the excess of merchandise and silver products over imports amounted to $133,000,000, and in the following year the balance in favor of this country was $315,000,000. The present year trade is still more favorable, the excess of merchandise alone over imports for eleven months being nearly $572,000,000—a truly magnificent credit balance.

It is still too early to speak with assurance of the probable requirements of Europe during the coming year, but the outlook is hopeful. Crop prospects in this country are very favorable, the wheat crop promising the largest aggregate yield ever known. The high price of wheat during last season has doubtless reduced the usual interior and invisible stocks of wheat in this and other countries, and the world's supplies are now largely in sight at the principal points of accumulation. For this reason large crops this year ought not to be as depressing to values as they would be if supplies of old wheat were large, and there is reason to hope that fair prices will be obtained for a bountiful supply of agricultural products during the coming year.

The remarkable showing made by our export trade in agricultural products and the hopeful outlook cannot fail to have a most important bearing upon the material prosperity of this country.

PROPER CARE FOR OUR SOLDIERS.

From various sources are echoed complaints of shortcomings and indifference regarding the treatment of our soldiers, both regulars and volunteers; and these are openly ascribed to political intrigue and monetary influences whereby ignorant and incompetent individuals are thrust into positions that, by all right and justice, should be filled by skilled and specially trained subordinates from the regular service.

The statement is made that in matters of transportation troops have not been treated even with the consideration accorded to "perishable live stock," the conditions obtaining, at best, being worse than the worst that could accrue to an emigrant ship. En route they have been deprived of all the essentials of health and comfort, no means being provided for securing of water or cooking of food; and at the terminus of the journey, reached perhaps late at night, and after a week of fatigue, no preparations are made for reception, not so much as a camping site selected—even cavalrymen have been separated from their horses, which were thus, perforce, left unfed, unwatered, and every way uncared for, in one instance, at least, for forty-eight consecutive hours. The conditions of the camps also have been matters of criticism, the sites being selected without any regard to fitness, whether for health, for facilities in teaching new recruits their duties, or for general military maneuvers; they are often shadeless, the tents (of improper pattern) pitched in the midst of deep sands, with poor and inadequate water supply. The clothing designed for campaigning upon the northern frontier is still required to be worn under a subtropical sun; the food is of nauseous and improper character, that threatens a speedy outbreak of camp diarrhœa and scurvy. And last, but not least, the treatment accorded, and the surroundings, are those best calculated to break down the spirit and vitality of the individual, and dissipate any enthusiasm and military ardor that may yet linger.

There seems to be a general and well founded suspicion that the charges are not wholly baseless; but that they are exaggerated in many instances, sometimes drawn from untrustworthy sources, and even on occasion formulated as the result of incomplete knowledge of military affairs and exigences, seems probable. Yet, they have had sufficient influence and power to draw from the Secretary for War an authorized if not wholly personal statement, which is summarized as follows:

From May 14 to June 12 the Subsistence Department of the army has forwarded 29,123,945 rations weighing 32,180 tons. The Ordnance Department, working under difficulties—since it was necessary to induce private firms to enter upon manufacture involving sometimes the installation of new machines, tools and the education of workmen along special lines,—in the same time has secured constantly increasing supplies of special stores, until now the receipts practically equal the demand. All batteries have been equipped with six instead of four guns as heretofore, and the delivery of small arm cartridges is approximately, or soon will be, 700,000 per day, the field gun ammunition being proportionate and all of the latest patterns. Up to June 12, also, 51 steamships have been chartered as transports, four more to serve as water vessels, one for special signal service duties, besides one tug and three steam lighters, all of which required material overhauling and modification to meet the exigences of special service. The first order for mobilization of volunteers was on May 13, and in no case has unnecessary delay been reported; on the contrary, the regiments have been forwarded to their destination with dispatch and general freedom from accident, and at a rate that did not, per capita, average more than 1½ cents per mile, and as regard equipments and stores at one-half the prevalent freight tariff. The regulars were assembled with satisfactory dispatch through the efforts of the chief quartermasters of the different military departments. Altogether, the troops transported, in less than one month, consisted of 126 regiments of infantry, 34 regiments, battalions or troops of cavalry, 20 batteries of artillery, along with 28,020 horses and mules and 23,141 equipments for the latter; 4,515 wagons and ambulances, 106,382 blankets, 25,739 canvas coats and trowsers, 145,650 hats, 8,125 helmets, 123,128 blouses, 184,485 drawers, 130,785 flannel shirts, 324,667 stockings, 192,656 shoes, 92,844 leggins, 101,287 ponchos, 24,830 hammocks, 81,599 tents of all kinds, 3,820 mosquito bars and 2,000 head nets.

All this certainly makes a very respectable showing, on paper at least, but would seem to have been prepared with a view rather to divert attention from the salient features in the charges made than as a reply. No notice is taken of abuses, real or assumed; the questions of incompetency and neglect on the part of officials appointed for political or other personal reasons, to the detriment of the service and wronging of competent and experienced individuals, are ignored; not a word appears regarding the quality and suitability of clothing or rations, or of the imperfections of camps, of camp equipage and camp locations, to say nothing of minor shortcomings, that if true could not fail to demoralize any body of troops, let alone our own with their lack of seasoning, suitable training, etc. All these are vital, and we wish the Secretary for War had taken them into account, and, if true, even in part, afforded some assurance of speedy reform.

That abuses do exist and have existed is self-evident; but that they are or have been avoidable we do not profess to know. Many, undoubtedly, were (or are) inseparable from measures necessitating a speedy mobilization of regular troops that have scarce any experience in regimental and brigade organizations, or of volunteers that are almost wholly formed of raw material. Neither the issuance of new forms of rations or of new uniforms can be made matters of a few hours, and comparison with European nations, who constantly keep magazines of stores in readiness for a quarter of a million of reserves, are not at all pertinent. The United States has never had reserve equipments of clothing or provisions for more than a mere handful of troops, and the present crisis may teach a lesson in this regard. Further, while that which has passed cannot be corrected, there are no excuses for the future. Officials cannot longer shield themselves behind the barrier of lack of specific information or the impossibility of securing supplies in consonance with the demand—this is

practically and essentially admitted by the Secretary for War.

RELIEF FOR THE PATENT OFFICE.

The "Act for Revising and Perfecting the Classification of Letters Patent and Printed Publications of the Patent Office," as passed by the Senate a few weeks since, was, on June 6, concurred in by the House by a vote of 153 to 58, and has been signed by the President. The complete text of the bill is as follows:

Be it enacted, etc., That for the purpose of determining with more readiness and accuracy the novelty of inventions for which application for letters patent are or may be filed in the United States Patent Office, and to prevent the issuance of letters patent of the United States for inventions which are not new, the Commissioner of Patents is hereby authorized and directed to revise and perfect the classification, by subjects-matter, of all letters patent and printed publications in the United States Patent Office which constitute the field of search in the examination as to the novelty of invention for which applications for patents are or may be filed.

SEC. 2. That for the purpose of enabling the Commissioner of Patents to carry out the provisions of this act the Secretary of the Interior is hereby authorized to appoint from time to time, in the manner already provided for by law, such additional number of principal examiners, assistant examiners, first-class clerks, copyists, laborers, assistant messengers, and messenger boys as he may deem necessary: Provided, however, That the whole number of additional employes shall not exceed 3 principal examiners, 2 first assistant examiners, 2 second assistant examiners, 6 third assistant examiners, 5 fourth assistant examiners, 4 first-class clerks, 4 copyists, 6 laborers, 6 assistant messengers, and 6 messenger boys; that the annual expenses for this additional force shall not exceed the sum of $92,880.

Notoriously, for many years, the delays incident to securing letters patent have been both wearying and vexatious, to say nothing of the jeopardizing of many interests essential and financial. Eighteen months, even two years, have in some instances been consumed ere the desired papers, and the protection they are supposed to afford, could be secured, and that, too, in the face of the fact that Patent Office employés have long been worked harder, and worked more overtime, than those in any other department of the United States government, and, moreover, have annually turned into the Treasury more money representing actual net profits. Such a deplorable condition of affairs is no reflection upon the conduct of the Patent Office or its Commissioner, but is due to the lack of interest in the matter taken by the members of Congress in the past, and a failure to fully appreciate the great necessity for maintaining the work of the Patent Office at the highest possible standard. As a result, the work of the Patent Office for more than a decade has been going behind in consequence of the increasing business; and the complaints regarding delays—absolutely inevitable under the conditions existing—hourly grew in number and in insistence.

Inasmuch as the Patent Office is more than self supporting—its net profits in 1897 being fully $352,000—coupled with the fact that it already has lying idle in the Treasury more than $5,000,000 that by enactment are utterly unavailable for any purposes whatsoever except those of this office, it seems surprising that any combination should be formed among legislators for the purpose of rendering this surplus useless. It must be remembered all receipts of this department are at once turned into the United States Treasury and that the current expenses are obliged to be provided for from the same, by legislative appropriation.

When the Act came before the Lower House on its final passage, the animus of certain members was actively displayed, and objections of the most petty and trivial character formulated. Among the most persistent opponents was Mr. Dockery, of Missouri, who willfully and wantonly ignored all evidence and facts, and emotionally appealed to the House not to increase the burdens of the people of the United States by class legislation at a time when the general tax rate is required to be advanced in order to carry on a war with Spain; and though while on the floor he was repeatedly corrected and shown that the fund from which the appropriation must come was the property of the inventors of the country and should not be diverted to other uses, the gentleman insisted upon declaiming regarding a hypothetical outrage about to be perpetrated on the tax-paying community at large. Neither argument, reason nor fact could stay the current of this sophistical tirade, and to the last, the representative from Missouri assumed that his position was dictated by economy and the interests of the country in general.

By the courage and insistence of the Commissioner and the friends of the Patent Office in the Senate and House, a victory has been won that is not only commendable per se, but that will prove of far-reaching benefit. The Commissioner expects that all arrearages will be disposed of by January next; also, that a newer, better and more direct and comprehensive system of examination and classification will speedily be inaugurated, whereby definite decisions and comparisons can be given that will relieve the patentee of the burden, so frequently necessitated, of appeal to the courts to establish the rights and status of an invention.

It is greatly to be hoped that the new order of affairs, once entered upon, will be permitted to exist, and that the Patent Office will no longer be hampered by captious and trivial legislation; that, in fact, a strictly businesslike and profitable department will be permitted to conduct its affairs along strict business lines. When Mr. Duell took charge of the office, in February last, there were nearly 10,000 new and nearly 4,000 amended applications awaiting its consideration. The new work on applications dated back to July, 1897, and amended applications back to September, 1897. The Commissioner early directed that the old work be brought and kept up to within fifteen days, and whenever necessary the force was required to remain until five o'clock to accomplish this result. By this means the office has made a gain of 1,200 cases in amended work, but the Commissioner expresses himself as opposed to this unjust although necessary discrimination against his force, which he claims is a force unequaled by that of any other bureau.

We desire that our readers shall understand that persistent efforts have been made by the Commissioner in his desire to advance the interest of the bill. We congratulate him on the success attained, and Congress upon recognizing the urgent needs of the inventors and patentees of the country.

No greater evidence could be advanced of the intelligence and liberal spirit of the present Congress than the attitude it has taken in passing this bill by such a large majority. It is welcome to all classes in the community to feel that the manufacturing and industrial interests of the country as protected by our patent system is being fully upheld.

LATEST PHOTOGRAPH OF COMMISSIONER OF PATENTS CHARLES H. DUELL.

STREET CLEANING IN EUROPEAN AND AMERICAN CITIES.

After an extended personal examination of the street cleaning methods in vogue in the principal Continental cities—London, Birmingham, Brussels, Paris, Berlin, Cologne, Munich, Turin, Genoa, Vienna and Buda-Pesth—Ex-Commissioner George E. Waring, Jr., embodies his observations in a detailed report to the mayor of the city of New York. Though many novel features were noted, little was discovered that offered improved effectiveness or facilities over methods now in vogue in one or two cities on this side of the Atlantic, and in many instances the procedures are much more crude and clumsy. In the matter of street sprinkling, however, most foreign cities are superior to our own, in that it is not done by contract, or farmed out, but undertaken exclusively by the municipality; hence all streets and portions of streets are sprinkled uniformly; and, as regards asphalt pavements at least, water is not allowed to stand or accumulate, but the surface is frequently "squeegeed" or dried by means of a rubber scraper.

The most important and suggestive consideration offered by Mr. Waring is that which concerns the relation of the people to the work, and largely, as leading to that, the manner in which the police intervenes to prevent the littering of streets. While the municipal ordinances relating to such are nowhere better than those of New York and other American cities, the vital differences lie in the enforcement thereof.

In Europe all ordinances are enacted with the view of being strictly enforced; in the United States generally, many ordinances merely serve to encumber the statute books, being treated as matters of form unworthy of further consideration, once they have been duly engrossed. Abroad the "guardian of the peace" would no more think of disregarding an act that would lead to littering the street, or the accumulation of filth therein, than he would of disregarding the operations of burglars or highwaymen. In cisatlantic cities, the policeman dignifiedly saunters by a crowd busily engaged in littering the street, utterly unconscious, seemingly, that an ordinance is being violated; but on the Continent such act, if by a resident, entails prompt arrest followed by a fine; if by a stranger, he is first required to remove the cause of his offending and is then cautioned against repetition; even if but a tiny scrap of paper has been thrown down, it must be at once recovered, or the full penalty will be exacted. One notable feature observable in Continental cities is that no one expectorates on the footwalks, but when such act is rendered necessary, it is the carriageway or gutter that suffers; and an ordinance to this effect, if enforced, would go a long way toward making the footwalks of American cities more suitable to lady pedestrians.

In Austria and Austria-Hungary were found the best street sprinklers, best snow plows, and best street sweeping machines. The two latter were particularly effective, being specially adapted to the work required; each of the former is followed by an individual who carries the sprinkler from side to side as needed, insuring even distribution of the water on all portions of the pavement.

In the matter of disposal of sweepings and garbage, most Continental cities are sadly hampered. In some the refuse is carried far beyond the limits of the municipality by specially provided railway trains, to be dumped in some arid or unobtrusive locality, there to be systematically sorted, a part, perhaps, being utilized as filling for low and marshy areas. The sorting is chiefly performed by women and children, who receive only a mere pittance at most. Some English boroughs have adopted cremation, and however ideal the process may seem, it is not without unpleasant features; aside from odors, the fine dust and ashes that result upon combustion escape from the chimneys of the retorts, are carried to considerable distances, and create a constant annoyance and cause of complaint on the part of residents of the neighborhood; the higher the chimney, the greater the area thus affected. Manifestly, cremation of garbage will not increase in public favor, and it has already been practically abandoned in several American cities where it has been attempted. In Detroit, Michigan, especially, it has entailed a series of lawsuits against the municipality.

The principal thoroughfares in London are kept as nearly clean and immaculate as it is possible for them to be made by human device and ingenuity. Boys with brushes and exaggerated iron "dust-pans" are constantly on the alert, and anything and everything is swept up almost as soon as it touches the pavement, to be deposited in close boxes placed at regular intervals along the curbs; and these boxes in turn are replaced by others several times daily, the filled receptacles being carried away by relays of carters.

Ignoring the difference in wages paid to street cleaning employes, the expense entailed in keeping cities clean is not less, and oftentimes considerably greater, abroad than in the United States, accepting New York as a type of the latter; and even when the matter of wages is also computed, the advanced expense here entailed is trifling by comparison.

The ease with which dust, ashes, paper, droppings of cattle and other garbage is disposed of, coupled with the monetary returns accruing to sortage and sales, are no inconsiderable factors in reducing the expenses of street cleaning in New York; the advantages of this city in these directions are practically without a parallel on either hemisphere. But road-making, paving, and especially the preparing of road-beds prior to surfacing, is, as a rule, considerably further advanced in Europe than in the United States. Asphaltum pavements are uniformly better; but those surfaced with wood are decidedly worse, though better cared for. Macadamizing is in its infancy in this country, and there is much to be learned as regards the preparing of the road-bed prior to surfacing. Stone pavements abroad are much more carefully and thoroughly laid, and the blocks better prepared, being nearly as uniform in size and surfaces as pressed bricks, thereby avoiding unsightly joints which serve to accumulate filth.

The final conclusions of Ex-Commissioner Waring are, that while cisatlantic cities, including New York, afford material opportunities for improvement in street cleaning and road-making, they have little to learn as regards the former from the methods that obtain in Europe.

A UNIQUE feature of nearly all homes and offices in Manila is the use of tiny square panes of translucent oyster shells instead of glass. The windows measure on the average six feet long and four feet wide and contain 200 of these oyster shell panes, which temper the fierce glare of the sun in the building. In a country where many people go blind from the constant sunshine this is a precaution very necessary to be taken.

A Decision in the Sprague Motor Case.

After having been considered and passed upon by nearly every United States judge in this district, including those comprising the United States Circuit Court of Appeals, the suit of the Sprague Electric Railway and Motor Company against the Union Railroad Company and the Walker Company would appear to have at last been finally settled by a decree rendered by United States Judge Wheeler, in which the Court of Appeals concurs, unless the defendants decide to carry the litigation to the United States Supreme Court.

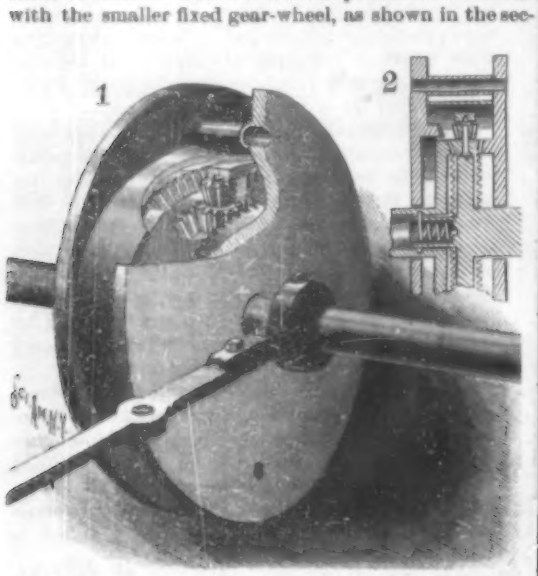
Judge Wheeler decides that the plaintiff is the owner of the patent for an electric railway motor, the original inventor of which was Frank J. Sprague, and orders that the defendants be perpetually enjoined from making, using or selling the device. His Honor also directs that the defendants pay to the plaintiff all profits which they may have derived from the infringement and use of the Sprague patent. Commissioner Shields is designated as master to take an account of such profits and to report to the court.

This decision involves many thousands of dollars and the payment of royalties to the Electric Railway and Motor Company by railway companies throughout the country that are using the Sprague trolley device.

AN IMPROVED DIFFERENTIAL GEARING.

The gearing represented in the engraving comprises two shafts rotating independently of each other and yieldingly connected by a coiled spring held in the reduced hollow end of one of the shafts. The shaft carrying the coiled spring is provided with a disk upon which axes are mounted carrying pinions. Upon the other shaft a gear-wheel is mounted. Of the pinions carried by the disk, the lower ones are always in mesh with the gear-wheel on the shaft, but may be moved in or out of engagement with a fixed gear-wheel held in the frame of the apparatus opposite to the shaft gear-wheel. The other or upper pinions can be made to engage a larger gear-wheel also fixed to the frame, but arranged on the same side as the gear-wheel mounted on the shaft. The two fixed gear-wheels are adapted to engage the pinions alternately.

Upon rotating the gear-wheel shaft, the pinions are made to revolve. When the lower pinions are in mesh with the smaller fixed gear-wheel, as shown in the section, they roll off on this fixed gear-wheel, and, therefore, the disk carrying the pinions is made to revolve on the shaft on which it is formed. When, by shifting the disk shaft, the upper pinions are made to mesh with the larger fixed gear-wheel, then an opposite motion and different speed are imparted to the disk shaft, as the upper pinions roll off on the larger fixed gear-wheel. If, on the contrary, the disk shaft be rotated, then the disk carries its pinions around and they then roll off on either of the fixed gear-wheels and, consequently, cause the shaft gear-wheel to rotate the shaft upon which it is mounted.



FYFE'S DIFFERENTIAL GEARING.

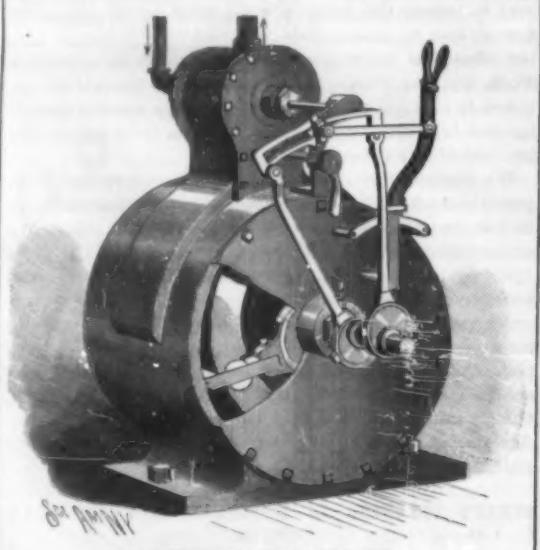
When it is desired to change the pinions, the coiled spring in the reduced end of the disk shaft is made to yield longitudinally, so as to permit both shafts to be moved closer together or farther apart, depending upon the size of the new pinions.

The gearing is the invention of Daniel Fyfe, of Covington, Tenn.

MORE or less aluminum is now utilized in the manufacture of scales, especially in the more delicate machines. Many makers use aluminum for beams, pans, riders, bars, levels and bows, in making their fine balances and weights. By using aluminum, greater delicacy can be attained in weighing than when the scales are made of heavier metals, while it is easier to make levels of aluminum, for the metal can be more readily spun around the glass of the spirit level than brass.

A NEW ROTARY ENGINE.

The rotary engine illustrated by the accompanying engraving comprises a cylinder in which a power shaft is eccentrically mounted. The wall of the cylinder has exhaust ports leading from its central portion and communicating with an exhaust port in the head on the cylinder. Inlet ports are also provided which conduct steam from the head to the interior of the cylinder. The head has a steam port designed to communicate with a hollow cut-off valve mounted to oscillate in the head and having an open end into which the live steam may enter. A piston disk is mounted on the shaft eccentric to the cylinder, so that its upper portion will engage the upper portion of the interior of the cylinder, thus providing an abutment for the steam. Piston wings are movable in oppositely extended openings of the piston disk and the opposite ends of their inner portions are provided with segmental straps engaging with rings secured to the cylinder eccentrically to the shaft. Rocking-blocks oscillate in concave recesses at the outer ends of the openings in the piston disk, and between these rocking-blocks the wings slide as the piston rotates. A lever on the exterior controls a reversing valve in the head and may be turned into register with either of the two sets of ports, depending upon the direction in which it is desired to run the engine, thus providing a means for reversing. A simple arrangement of levers and eccentric rods connected respectively to the cut-off valve and the shaft enables the steam to be cut off at any point where it is desired that the expansion shall take place. The engine has been patented by Fred J. Macey, of Ontonagon, Michigan.



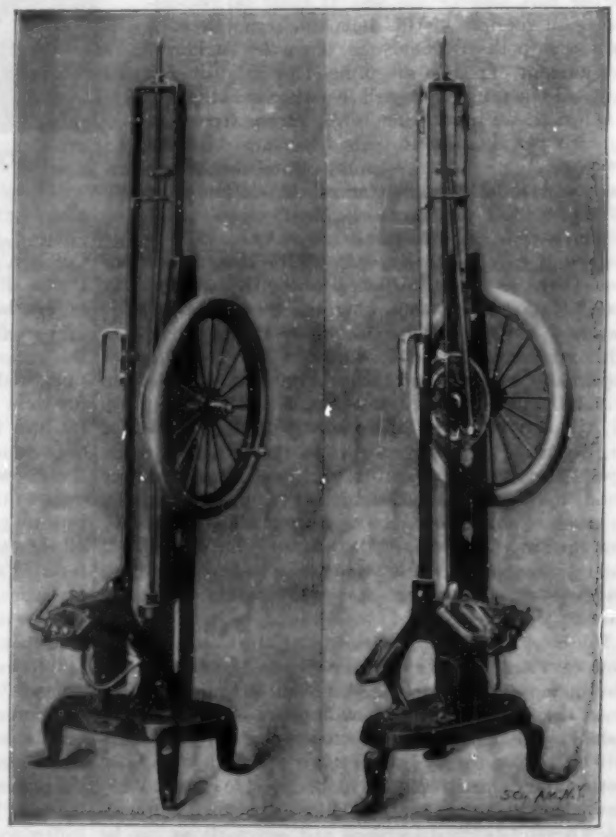
MACEY'S ROTARY ENGINE.

A COIN-CONTROLLED BICYCLE-PUMP.

A patent has been recently issued for a novel bicycle-pump, which is controlled by a coin. The pump is put in operative position by the insertion of a piece of money and thrown into inoperative position by the removal of the wheel. The device is the invention of Lewis S. Brown, of 1242 N. High Street, Columbus, O.

In this invention a frame is mounted on a stand provided with two hooks for supporting the lower portion of a bicycle wheel. A third hook is secured to a vertical support connected to the frame, and receives the upper portion of the wheel. A bicycle pump is provided which is operated by a crank-wheel mounted on the vertical support and connected to the pump-rod by means of levers and bars. This crank-wheel is turned by a larger wheel made to resemble a bicycle wheel, and provided with a handle. In the upper portion of the frame is a casing containing the pump-controlling mechanism.

In operation, the bicycle wheel is first placed in position and the tire connected to the pump. A coin being then dropped into a slot, acts upon a locking lever to release a plug-valve, which may then be turned by hand engagement of an outside lever, so as to connect the tire and the pump. A locking arm is also connected with this lever, and is moved thereby to clasp and lock the wheel in place. When this locking arm is thrown back to release the wheel after the tire has been inflated, the valve is closed and the valve-locking lever drops into place, preventing the valve from opening until another coin has been inserted.



COIN-CONTROLLED TIRE-INFLATER.

M. GENTIL'S expedition has succeeded in working its way down the Chari River into Lake Chad, which it has explored, and in getting back to French territory, after making a treaty with the Sultan of Bagirmi.

Soldering of Aluminum.

The soldering of aluminum has always been a difficult problem, and the problem has not been, up to the present time, completely solved.

The difficulties in soldering aluminum arise from:

1st. The high heat conductivity of aluminum; and

2d. The fact that none of the ordinary soldering salts, or any easily obtainable soldering salt, will clean the surface of aluminum.

On account of the high heat conductivity of aluminum, the heat from a soldering iron is conveyed away from the iron and from the solder so rapidly that the solder does not become sufficiently liquid to flow readily. This can be overcome to a large extent by taking steps to counterbalance the spreading of the heat. If the aluminum pieces to be soldered are small and thin, then naturally the difficulty is not so great as when the aluminum pieces are heavy and absorb a large amount of heat. In this latter case the soldering iron should be kept at a higher heat than is usual and the aluminum pieces should, if possible, have been warmed beforehand.

Whereas aluminum is properly spoken of as a non-oxidizable metal, nevertheless the surface is covered with a very thin film of oxide, which prevents the solder from amalgamating with the aluminum. The most natural and simple way to remove this coating is to scrape it off with emery cloth or a file. If this is not possible, then it can be done by dipping the edges to be joined in a solution composed of about:

Hydrofluoric acid	1 part.
Nitric acid	10 parts.
Water	50 "

Or in a solution, first of caustic soda, and then strong sulphuric acid.

Many manufacturers, after some attempts with indifferent results, are now soldering aluminum with considerable success. Experience seems to be a very important factor in the successful accomplishment of the soldering of aluminum. A workman who perhaps is experienced in the soldering of other metals will meet with considerable difficulty in the soldering of aluminum, but these difficulties become less, and in time practically vanish, as the experience of the workman increases.

The Pittsburg Reduction Company, who have collated the above particulars, do not, however, recommend soldering, if any other means of making a joint can be employed. Soldered joints in aluminum, even when well made, are not as strong as soldered joints in other metals, and on account of the galvanic action between the solder and the aluminum, the joint will gradually disintegrate, especially if, by exposure to water or by other means, the conditions are particularly favorable for galvanic action. In dry places, however, a soldered joint will apparently last an indefinite time.

In view of the high heat conductivity of aluminum, it follows that a solder which will melt at as low a temperature as possible should be used. There are a number of solders on the market having this characteristic, or one can easily be made to suit the occasion. Nearly all aluminum solders contain a small portion of phosphor tin.

A STANDARD OF WEALTH IN RUSSIAN ARMENIA.

BY E. O. HOVEY.

In arid and semi-desert regions the question of fuel is one that taxes the resources and ingenuity of the inhabitants. The people who live in Russian Armenia have solved the question in a way that forms a very striking feature in the views of all the villages of the plateau. After the grain has been thrashed, the remaining straw is piled up in great stacks on the low, flat roofs of the houses and stables, where it will be convenient for use as bedding for the stock. Much of the straw, however, is mixed with the fresh manure as

WALLS OF STRAW-MANURE FUEL.

that is taken from the stables from day to day. The mixing is usually done in round beds made by raising a low ridge of earth, using an implement like a hoe for the work. Then square or round cakes of the mixture are made with the hands and plastered up on a wall to dry. When dry, these cakes are piled up in conical or pyramidal heaps, which are frequently ten or even fifteen feet in height. These piles seem to be hollow, so as to permit a free circulation of air to insure thorough drying. The illustrations show the curious forms in which these piles are made. In many cases there is a small opening at the bottom of the stack to allow of its being used as a kennel or chicken house or something else of that sort. These dried cakes of dung mixed with straw are almost the sole dependence of the country people for fuel, and, as a consequence, in the semi-desert, the man who possesses a large quantity of this material is considered wealthy and his daughters are desirable matches.

Features of the New Battleships.

Secretary Long has just published a circular which defines the characteristics of the three seagoing coast line battleships authorized by the new Naval Appropriation law. It is proposed that the new ships shall have a load water line of 368 feet; the breadth at water line will be 72 feet; and the mean draught at the normal displacement 23½ feet; the normal displacement is to be 11,500 tons and the total coal capacity 1,200 tons. The hull is to be of steel, with a double bottom, and is to be subdivided by watertight compartments. The hull at the water line is to be protected by an armor belt of a maximum thickness of not less than 16½ inches and a mean depth of 7 feet 6 inches. This belt is to extend at least from the stem to the after barbette and to maintain the maximum thickness through the engine and boiler spaces. From the boiler space forward it may be tapered to a uniform thickness of 4 inches. The transverse armor just forward of the boiler space and at the after end of the belt will not be less than 12 inches in thickness. Throughout the length of the vessel a protective deck is to extend. Where this deck is worked flat the total thickness will not be less than 2¾ inches, and where worked with inclined sides the slope will be 3 inches in thickness forward and 5 inches in thickness aft. A cellulose belt is to be fitted along the sides for the whole length of the ship. The barbettes for the 13-inch guns will have armor 15 inches thick, except in the rear, where it will be reduced to 10 inches. The turret armor is to be 14 inches throughout. The ship's sides, from the armor belt to the main deck, will be protected by not less than 5½ inches of steel armor from barbette to barbette. Coal is to be carried back of a portion of this 5½-inch casing armor.

In a suitable position will be a conning tower of not less than 10 inches in thickness, having an armored communication tube 7 inches in thickness. Four 13-inch guns will be mounted in two heavy barbette turrets on the midship line, one forward and one aft. There will be ten 6-inch rapid-fire guns in broadside on the main deck, four on the upper deck within the superstructure, and a secondary battery of twenty-four rapid-fire and machine guns. The 6-inch guns on the upper deck will be protected by 5½-inch armor. There will be two submerged torpedo tubes. The torpedo compartment will be fitted up for the storage of eight 17-foot torpedoes and appliances and means for operating and handling the same.

The vessels will be driven by twin screws. The engines will be of the vertical triple-expansion four-cylinder type, two in number, one on each shaft, and they will be placed in separate watertight compartments. The eight boilers are to be cylindrical and single ended. They are to be placed in four separate watertight compartments, and will work at a pressure of 210 pounds. If on trial the average speed shall equal or exceed the speed at sea of 16 knots an hour for four consecutive hours, the vessel will be accepted as far as the speed is concerned. If the speed falls below 16 knots and exceeds 15 knots an hour, the vessel will be accepted at a reduced price, the reduction being at the rate of $25,000 per quarter knot, if the deficiency of the speed lies between 16 knots and 15½ knots, and at the rate of $50,000 per quarter knot between 15½ knots and 15 knots. If the speed falls below 15 knots an hour, the vessel will be rejected or accepted at a reduced price. No sail will be carried, but two military masts are to be fitted with fighting tops.

The New Naval Academy.

The complete rehabilitation of the Naval Academy at Annapolis being assured by the Congressional appropriation of $1,000,000 to start operations—the estimated expenditure being $6,000,000—work is to be begun on the dredging and the sea walls. The first structures to be undertaken are the armory and the boat house and the power house. At the present time, when the navy arm of the service is first in the public eye, the future of the American navy will probably be a matter of solicitude for some years to come. With the requirements of modern sea defense comes the necessity for a splendidly equipped school for those who are to be responsible for the management of our fleets. The old naval school, which was opened in 1845, is a motley assemblage of buildings, which are now inadequate and out of date, so that they tend to militate against the success of the modern courses of instruction.

Plans to alter and reconstruct these buildings were considered, but they were abandoned as stumbling blocks in attaining the end aimed at—a practically new academy. A commission was appointed, which reported against tinkering with the old buildings and in favor of new ones. The architect, Ernest Flagg, of New York, prepared the approved plan for the rebuilding of the Academy.

The present Academy occupies three pieces of ground more or less separated from each other, lying to the north of Annapolis and on the Severn River. The original plot was an irregular triangle containing numerous buildings, almost all of which are old and dilapidated. They were built at different times, and placed haphazard with little regard to the convenient working of the institution, and the most beautiful part of the property is occupied by the gas house and sheds, which serve to cut off a fine view of the bay.

MONUMENTS OF ARMENIAN FUEL.

The only interesting building on the grounds, except perhaps the old fort, is the library, formerly the residence of the Governors of Maryland; this is to be preserved.

The new plan contemplates the gradual demolition of all the old buildings, except the two last mentioned. When the plan is fully carried out, the buildings will be disposed in three groups, located respectively at the east, west and south of the campus, leaving the fourth side open to the river. The first of these groups contains the cadets' quarters, the armory and the boat house. The cadets' quarters will afford accommodation for 500 cadets, all of the rooms having views of either the Severn River, the bay or the campus. The armory is to be connected with the cadets' quarters by a colonnade. It consists of a main drill hall and gallery for models, and it will also contain various recitation rooms, etc. The boat house corresponds in size and general appearance to the armory, and occupies a corresponding position, and faces the large basin, which opens into the Severn River, and will be connected with the cadets' quarters by a colonnade. It will likewise accommodate 12 cutters, 12 sailing launches, 12 steam launches, 4 small torpedo boats and 2 large ones. It will also contain recitation rooms, model rooms, etc.

The campus, with its shaded walks, occupies the central portion of the architectural scheme. The chapel will be located in the center, and to the rear

MOUND OF ARMENIAN FUEL.

will be the officers' house. Fine walks will lead from the chapel to an exedra containing a band stand, and in front of this is the basin in which is to be moored the fleet of cutters, practice boats and torpedo craft. The third group of buildings lies on the other side of the campus, and faces the cadets' quarters. The group consists of the academic building, power house, steam engineering building and the physics and chemistry building. The academic building will be second in size and importance of those proposed, and will contain the administration offices, class rooms and the library. The other appointments will be most modern and appropriate. The Naval Academy, with the splendid record of the past, opens a second half century of existence with a deep-seated pride and with the knowledge of the affection in which the heart of this great nation holds the navy, and the new buildings are a propitious augury for a magnificent future for this service.

An Interesting Discovery.

Prof. Ramsay and Mr. Travers have recently made some interesting discoveries on the constituents of the atmosphere. Since the discovery of argon, it has been a question whether it was really an element This was very difficult to settle, owing to the impossibility of employing any ordinary chemical test, but Prof. Ramsay and Mr. Travers announced to the Royal Society of London, on June 16, the results of experiments which may be summarized as follows: They prepared a large quantity of argon from atmospheric nitrogen, separating the latter gas by means of magnesium, and having liquefied it by cooling it with liquid air, they then fractionally distilled the product. The first portion, says The New York Sun's cablegram, consisted of less than 100 cubic centimeters, distilled off from the liquid obtained by condensing 18 liters of argon, was found to have a density of about 13 instead of 20, which is that of argon, and its spectrum differed from that of known gases. The yellow line was less refrangible than those characteristic of helium and crypton, being especially prominent.

On continuing the distillation, after nearly the whole of the liquid argon had been evaporated, a solid was obtained which only slowly volatilized. The gas into which this solid was converted was found to be practically of the same density as argon, but its spectrum was altogether different and peculiar, consisting for the most part of bands, not lines.

It is proposed to call the lighter element neon, and that derived from the solid metargon.

The further development of the investigation is awaited with interest. The success of the experiments hitherto is regarded as a striking proof of the value of the new engine of research which liquid air affords.

ELECTRO magnets capable of picking up a load not exceeding five tons are used by an Illinois steel company to transfer steel beams or plates from one part of the shop to another.

Science Notes.

Prof. S. P. Langley, of the Smithsonian Institution, states that the bolometer (or actinic balance) is capable of indicating a "change of temperature in its strips of, at any rate, much less than one ten-millionth of 1° Centigrade." The apparatus is about 400 times as sensitive as when first described in 1881.

Those of our readers who are interested in astronomy will be glad to know that they can obtain the lantern slides and prints from the astronomical photographs made at the Yerkes Observatory, at a moderate expense by addressing G. W. Ritchey, optician, at Williams Bay, Wis. He is prepared to supply lantern slides, transparencies and paper prints from any of the negatives in the collection of the observatory A complete list of the subjects will be sent on application.

Herr W. Zaleski discusses the controverted question whether albuminoid substances can be formed in the plant in the dark. From a series of experiments on sunflower leaves he has come to the conclusion that the nitrates taken up into the leaves are there decomposed and transformed into other nitrogenous compounds. This transformation is connected with the access of sugar, which renders possible the passage of nitrates into other compounds, probably of the nature of amides. These processes can take place in the dark. —Ber. deutsch. bot. Gesell., vol. xv., 536.

Prof. A. Hansgirg proposes the following classification of pollen grains, dependent on their power of resisting moisture and on their protection against unfavorable atmospheric influences: (A) Plants whose pollen is resistent to moisture and germinates in pure water: (a) species in which the sexual organs are more or less protected against rain, etc.; (b) species in which the sexual organs are only slightly or not at all protected against atmospheric precipitations. (B) Plants whose pollen is not resistent to moisture, and does not germinate, or only very imperfectly, in pure water: (a) species in which the sexual organs are completely or partially protected against rain; (b) species in which the sexual organs are only slightly or not at all protected against rain, usually completely exposed. The class to which any particular pollen grain belongs does not depend so much on the affinity of the species as on its special habit.—Sitzber. kön. Böhmisch. Ges. Wiss., 1897.

An interesting illustration of natural engineering is the well-known heavy dike on the Holland coast which was built by the winds themselves. The sand formed between the jetties becoming dry in sunny weather, and the surface blown ashore on the wind blowing in that direction, it was desired to build a strong dike to connect with the sand dunes, and this was accomplished by setting in the sand, in rows about one foot apart, tufts of dune sea grass near by. The tufts thus placed, consisting simply of little handfuls of grass, were put each one into a cavity dug out with the hands, the tufts being set into this and the sand pressed around. The whole surface of the dry, sandy beach above high tide was covered with this plantation, and just back of it, at the highest point of the existing sandy area, one or two rows of reeds were set in the sand, their tops cut off and the stalks left standing about four feet above the sand—the latter drifting along over the surface, catching and in one day almost burying the tufts of grass and standing up one foot along the row of reeds; then another plantation being made, and another, a massive dike was thus built up to the height of the adjoining dike. In high storm tides the waves eat into the top of the slope and pull down the sand, but, by the same process of building, the dike is again restored to its former size.—Invention.

An interesting series of experiments in which a hollow hemisphere of metal was made to collapse by the pressure applied on top of it by another hemisphere or plane is described by Prof. H. Schoentjes, of Ghent, in the current Bulletin de l'Académie royale de Belgique. Prof. Schoentjes gives excellent photographs showing various cases of collapse in segments; triangular, quadrangular, pentagonal and hexagonal forms being all represented. The present paper forms the sequel to one published in 1890, and among the author's conclusions the following are noteworthy: When two similar hemispheres of 10 cm. diameter were crushed together by a hydraulic press with their summits in contact, only one of the hemispheres collapsed; the cavity formed was spherical, and was moulded on the undeformed hemisphere just as if the latter hemisphere were solid. When a hemisphere of 15 cm. diameter was crushed against one of 10 cm., the smaller one penetrated nine times out of ten into the larger one; the cavity was at first spherical, but afterward its margin became polygonal. In one case only—and the author could not succeed in repeating the experiment—both hemispheres were deformed; the larger one first penetrated the smaller, but under a force of 80 kilos. the edge of the cavity began to penetrate the large hemisphere. When a hemisphere was crushed by a plane the normal deformation was found to be hexagonal.

AN IMPROVED TRACE-HOLDER.

The device represented in our illustration is designed to prevent the accidental slipping of a trace from the singletree to which it has been attached. The trace-holder is in general characterized by a spring fastened to the upper or lower side of a singletree and is provided with a hook that embraces the trace and prevents it from slipping off the tree. Our illustration represents part of a singletree with the device attached.

The trace-holder is made of a single piece of spring-wire whose body consists of a coil terminating at one end in two eyes, by means of which it is fixed to the singletree. The other end is formed with a hook having a long beak which extends through a ferrule in the tree

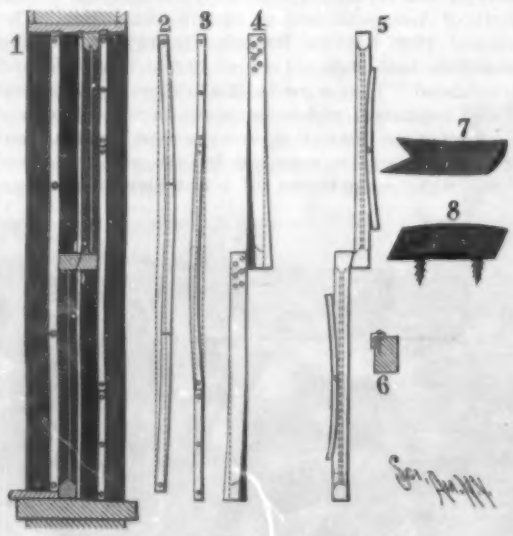
BARTLETT'S TRACE-HOLDER.

to inclose the trace and to prevent its slipping. The wire is doubled on itself to form the hook, and the free end is turned to enter the coiled shank portion. This shank portion has an outward curve and rests against the singletree only at its ends, so as to avoid rattling. In applying the trace, the hook is forced away from the singletree until the slit of the trace may be slipped over the ferrule. The hook is then allowed to spring back, its beak passing through the ferrule and inclosing the trace. The device is the invention of Granville Bartlett, of 360 South Broadway, Lexington, Ky.

A NOVEL SASH-HOLDER.

The sash-holder which we illustrate is the invention of John and Thomas W. Leask, of Gore Bay, Ontario, Canada, and is designed to enable the sashes to be held in any desired position, at the same time preventing rattling. The invention makes use of spring plates flexing edgwise in contradistinction to a flatwise movement, for the purpose of holding the sashes firmly to the frame. Of our illustrations, Fig. 1 is a vertical section of a window frame with the device attached; Fig. 2 is a side elevation of the inner stop and Fig. 3 a side elevation of the outer stop. Figs. 4 and 5 are modifications and Fig. 6 is a cross section of the sash and the spring shown in Fig. 5. Figs. 7 and 8 are detail perspective views of wear plates employed.

The arrangement illustrated in the first three figures consists in applying the spring plates to the sides of the window frame, the sashes sliding in the usual manner. The outer stop differs from the inner stop in employing a spring plate, whose bow is confined to the central



LEASK'S SASH-HOLDER.

portion of the plate, the ends being rigidly fastened. The intermediate portions of the plates constituting the inner stops have slots in which headed pins are inserted, so as to prevent inward bulging of the plates. Fig. 4 shows a modification in which the sashes themselves carry the spring plates. In this case the springs are fastened to the sashes at their inner ends, the outer ends being free. In Fig. 5 another modification is shown, in which the plates are curved throughout their lengths and secured at their centers to the side rails of the sash—a position which may be reversed.

In order to prevent the finish of the sashes from being marred, plates like those shown in Figs. 7 and 8 are employed, which prevent direct contact of the springs with the parting strip of the two sashes.

ACCORDING to Pediatrics, there is a law in France forbidding the giving of solid food of any kind to infants under one year of age without the written consent of a physician. The use of feeding bottles with long rubber tubes is also forbidden by law.

A Curious Safe.

In St. Augustine's Church, Brooklyn, N. Y., the tabernacle of the high altar is protected by probably the most novel safe ever devised. This is undoubtedly the first time in which practical science has been used as an adjunct in religious service. Of course, it was very essential that the beautiful altar itself should not be marred in any way by the safe and that it should be operated in a dignified and fitting manner. Unfortunately, in many churches, the richly jeweled receptacle for the sacrament has proved too often a bait for burglars, and many priests have tried to devise some scheme by which the security and sanctity of the tabernacle would be assured.

In the church to which we have referred the receptacle for the sacrament cost $10,000. The safe consists of circular curving doors which slide together, closing the front toward the church. The safe weighs 1,600 pounds and consists of four pieces, the base, a curving piece of steel at the back that is stationary and the two doors which come together. The leaves of these doors are made of Harveyized steel an inch thick. They meet as they close under the dome and overlap each other tightly by a scarf joint. They turn on roller bearings and they are operated by means of an electric motor. The safe is easily opened by manipulating buttons beside the tabernacle, but these push buttons will have no effect until the motor itself is set in motion in the vault below, the combination lock of the steel vault being known only to the priests of the parish. Electrical protection is also provided which would give notice at once to the nearest police station should the safe be tampered with. Masked in its covering of gold leaf, this steel shell is a superb piece of mechanism and it is one of the most ingenious uses to which the electric motor has ever been put. The same motor is used to drive a blower intended for the purpose of dusting the elaborately carved marble altar. An exhaust fan sucks away the dust.

The Current Supplement.

The current SUPPLEMENT, No. 1173, contains a number of articles of sterling interest. Subjects connected with the war are naturally in evidence. "The Queen Regent and Alfonzo XIII." is accompanied by a portrait of the King and his mother. "The American Regular" is by the English correspondent of The London Times on board the United States transport "Gussie." It gives an Englishman's idea of the regular army. "The Milestones of Human Progress" is a lecture delivered by Prof. Daniel G. Brinton at the Academy of Natural Sciences, Philadelphia, Pa. "Tombs of the First Egyptian Dynasty" is by Dr. Ludwig Borchardt, Director of the German School in Cairo. "An Amateur Chronophotographic Apparatus" describes a simple apparatus. "The Reclaiming of Old Rubber" is a very important paper by Hawthorne Hill and is one of the best contributions to this much neglected division of the literature on rubber. "Patents," by Mr. J. W. See, is continued, and the present installment of this paper deals with the employers' rights, combinations and aggregrations, genera and species, combinations and sub-combinations and mechanical equivalents. "The Development of the Central Station," by Samuel Insull, is concluded in this number.

Coaches on the Community Plan in Genoa.

A curious custom exists in Genoa. Many of the well-to-do people as well as those in moderate circumstances do not own either horses or coaches; they own only an interest in them. Four or five or a half dozen great families club together and buy a coach and horses, then they arrange among themselves the days the different families will use it. Thus one family uses the coach on Mondays, another on Tuesdays and a third on Wednesdays, so that an establishment that would be impossible for one family becomes perfectly practical when the cost is divided among five or six. Each family has a set of doors for the coach with their own coat of arms on the panels, which are changed according to the family which is going to use the coach. The builders of these vehicles seldom think of building a coach without five or six sets of doors, and arrangements are made so that they are very easily changed.

American Contracts in Russia.

Under the date of May 21, 1898, Ambassador Hitchcock writes from St. Petersburg that an order has been sent to the Baldwin Locomotive Works for sixty-five locomotives for the Manchurian railway, making a total of eighty Baldwin engines ordered for this railway within the last nine weeks and a total of 138 engines of this make sold to Russian railways within the last six months. The Imperial government has also awarded the Westinghouse Company a contract amounting to between $2,000,000 and $3,000,000 for the equipment of rolling stock of the Manchurian railway with Westinghouse air brakes. This contract will probably be duplicated in the near future. It appears that the Manchurian railway is entirely up to date in every particular, being equipped with the very best of American rolling stock.

THE WILD TRIBES OF THE PHILIPPINES.

BY PROF. J. B. STEERE.

The native inhabitants of the Philippines can be conveniently divided into four groups: the civilized Indians, the Mohammedans, the wild Indians and the Negritos or Attas. These same divisions existed at the coming of the Spanish in 1519, though their relative numbers, location and other conditions must have changed greatly since that time.

The wild and civilized Indians and the Mohammedans seem to be all of Malay origin and are closely related to each other and to the native tribes of Formosa on the north and Borneo and Celebes to the south.

The civilized Indians have increased rapidly since the Spanish occupation and are the real citizens and inhabitants of the Philippines. They occupy the coasts and the rich, level lands of the northern, central and eastern islands and have lately occupied new territory in Mindanao, Basilan, Palawan and Mindoro. They number, according to Spanish accounts, between six and seven millions.

The Mohammedans are decreasing in importance and probably in numbers also, but are still powerful in the south of the archipelago, where they occupy the Sulu Islands, a great part of Mindanao and Basilan, and have a foothold in Palawan. They number, according to Spanish statistics, about three hundred thousand. They appear to have been derived originally from native tribes of the same degree of civilization as the Christian Indians, but have fallen far behind them in progress, while the two religions have caused such separation and difference of customs and such mutual hatred as to make them really distinct peoples.

The Negritos or Attas are supposed to be of Papuan stock, and are, no doubt, the oldest living human inhabitants of the Philippines. They appear to have been driven by the flood of Malay invasion far inland into the mountains, where they have dwindled to a few thousand wandering, homeless savages. They are still found in certain portions of Luzon, Panay, Negros and according to some authorities, in Mindanao.

The uncivilized Indian tribes occupy much of the interior and mountainous parts of all the large islands of the group, except Cebu and Bohol, in which they have either been Christianized and merged with the civilized Indians or have been driven out. They still occupy nearly all the territory of the great islands of Mindoro and Palawan. They number, according to Spanish estimates, some three or four hundred thousand, belonging to over fifty different tribes.

They are shut off from the sea and means of communicating with one another and the outside world by the civilized Indians about them, and probably remain in much the same condition of savagery as when first observed by the Spanish.

It has been contrary to Spanish policy in the Philippines to subdue them by force, and, as they have usually remained at peace with their more powerful and better armed Christian neighbors, they still continue to exist beside them.

Missionary priests are still making some impression upon them in a few localities, and a few are baptized and become a part of the Christian communities; but this process is a slow one, for several reasons. One of these, no doubt, is the general apathy of the priests. But the Spanish treatment of the civilized Indians must have much to do in making these savages content with their present condition.

All persons of Indian blood who are Spanish subjects are compelled to pay an annual tribute of a few dollars, graduated according to age and sex. They are also compelled to live for a portion of the year at least in the incorporated towns, in which are churches, priests and government officials. These, with other forms of compulsory and unpaid service to the government and church, are claimed by the Spanish to be aids in civilization; the tribute making it necessary that the Indian, naturally indolent and improvident, earn or save something besides what he eats and wears, and the compulsory residence in the towns bringing him under the influence of the church and schools and other civilizing agencies.

These exactions of the Spanish government are enforced by the officials of the towns by flogging and imprisonment in the stocks.

The Indians find this system hard to bear, and their resentment is shown in the present and former rebellions. Their feeling toward the imposition of tribute is shown by their saying that the monkeys could talk if they would, but they keep silent, so as not to have to pay tribute.

Numbers of the civilized Indians, when in debt and unable or unwilling to pay tribute longer, escape to the mountains and forests, where they either join the savages directly or form little settlements of their own. The Spanish call these by the expressive term of remontados, men who have again mounted into the saddle of savagery. The aggregate of these remontados in the islands must be considerable. While at the town of Arevalo, in 1887, one of these men who had not entered his native town for three years, except as he had stolen in at night, paid his back tribute and other dues, from the money he earned as a hunter for our party, and again became a citizen. A system which is driving many back to a savage life can have little attraction for the independent Indians, and while in many cases they allow their children to be baptized, they generally prefer their liberty to the advantages of a civilized life.

Like the civilized Indians, the savages are brown in color, with coarse, straight, black hair and little beard. They seem to be somewhat smaller and slighter of figure than their Christian neighbors.

Their languages show close kinship to those of the civilized tribes adjacent and also as close to those of the savages of Formosa. Few of the tribes possess lands fit for the cultivation of lowland rices, and fewer still have the necessary skill and implements and plow beasts (buffaloes) for cultivating such lands. Their recourse is the common one of savages nearly the world round—they cut off small portions of the forest during the dry season, and after burning this over, they plant, at the beginning of the rainy season, upland rice, maize, sweet potatoes, etc., among the blackened logs and stumps. The supply of food thus gained is usually insufficient, and after it is eaten up they lead a miserable existence, scouring the woods for game and wild fruit and going to the sea beach wherever they can reach it for shell fish and other food. Their method of cultivation compels continual change of place. Their little patches of cleared forest can only be cultivated in their rude way for one or two years, when they are abandoned and new pieces of forest chosen. In hunting I have repeatedly found heaps of shells and bones and bits of earthenware, proofs of former occupation, in the midst of apparently virgin forest.

Their houses are usually built after the plan of those of the civilized Indians—a basketlike structure of bamboo and palm leaves raised upon posts above the ground, but they are not so well built and are occupied but for a few years. They are not built into compact villages, but a few scattered houses are formed without streets, but near enough to be within call. Necessarily, what can be said of such a multitude of detached tribes in regard to their clothing, arms, religion, etc., must be of the most general character.

Their clothing usually consists solely of the taparabo, or breech clout, all else generally being in the nature of ornament, and consisting of beads about the neck and head and arms, and anklets or leglets of boar's bristles, and frequently with bright colored pearl shells hanging upon the back or breast. The Spanish authorities do not allow the savages to enter the towns in their ordinary state of nakedness, which accounts for the unusual amount of clothing shown in the accompanying photographs. They frequently blacken the teeth, and in some cases file them to a point.

Some tribes wear a stiff, round hat similar to the salacot of the civilized Indians; other tribes wear a turban or go bareheaded. Tattooing is common among them, but varies with each tribe.

Their arms are a large knife or cutlass carried in a wooden scabbard, this serving for an ax and hoe as well as a weapon of war. In addition to this they carry a lance or spear, and some tribes are armed with bows and arrows. The more warlike tribes have shields of various forms.

Some of the wilder tribes of North Luzon are said still to hunt the heads of their enemies with which to ornament their dwellings, like the head-hunting savages of Formosa and the Dyaks of Borneo, but the tribes in contact with the Christian Indians content themselves with hanging the skulls of monkeys, deer, wild boars and buffaloes about their doors.

They all seem to have some idea of a great spirit who rules over the affairs of men. They also recognize spirits of lower orders, some good, some evil, the evil ones causing disease and death in men. Each village usually has one who serves as priest and doctor, who is supposed to be a special favorite of the great spirit. His chief duties seem to be to cure disease or to foretell its result. He is usually aided by certain old women who undertake to frighten away the evil spirit by cries and wild gestures. They do not appear to have idols, but some pay reverence to certain stones before which they place food and drink.

They have many forms of tabu, like the other island-dwelling people of the Pacific. At the death of a person a fence of bushes is built about the village, and for a certain period no one is allowed to enter or depart, food for those within being brought by friends to the fence, where it is received by those within.

They are usually monogamists, the wife being purchased from her parents. Divorce is common, the purchase price being returned with the divorced woman.

Their laws are proclaimed and enforced by the elders of the villages, rather than by chiefs or kings.

The Spanish, whenever they have come in contact with the wild tribes, have undertaken to gain influence among them by recognizing some head man of the village as chief, or gobernadorcillo, giving him as a symbol of his office a cane, and perhaps a few articles of cast-off military uniform.

My first visit to the Lagbanuas of Palawan was made in August of 1874. A small village of them existed near the newly established Spanish town of Puerto Princesa. The patches of rice among which their houses were built were not yet ripe, but they were already rubbing out the soft kernels and roasting off the hulls and eating them. They appeared like walking skeletons, having not yet recovered from the long famine since the last harvest. I was taken to the house of the gobernadorcillo, whom I found sitting at his door, clothed like the rest in a breech clout. He had planted several posts before his house, which were ornamented with strips of bark and colored leaves. After shaking hands with me, he retreated within his dwelling, and after a moment came out with his cane and dressed in an old Spanish military coat, with big brass buttons, and a cocked hat with tarnished bands and tassels. He undertook to show me a nearer way to the river, and strutted along the path before me with his cane, his thin, bare, brown legs sticking out below his military coat.

While in the interior of Mindoro in 1888, we were visited at our camp by the Mangianes. Those seen were a little people. The men were naked, but for the breech clout, and armed with knives and bows and arrows. The women wore a curious petticoat, made of apparently thin strips of rattan, braided into a narrow ribbon of the width of the finger. Many yards of this ribbon were wound about the hips and held in place by a strip of bark cloth fastened to the girdle. They gathered up the bits of crocodile's flesh which we were cutting off in making a skeleton, and roasting them at our fire, ate them with great relish. On their second coming they brought us wild honey and wild fruit in bark baskets, for barter.

In the future of the Philippines the wild tribes will probably have but a small share. They must be gradually merged with the civilized tribes or be as gradually starved to death by being pushed back by the rapidly multiplying civilized Indians. The hundred thousand Chinese and the two hundred thousand Mohammedans of the southern islands will form more powerful factors in making future history, as they have already in making that of the past.

Carrier Pigeons in War.

It was expected that the war would develop the usefulness of the carrier pigeon service in communicating with ships at sea and the pigeon cotes at naval stations, but up to the present time they do not seem to have been made much use of, or, if so, the results obtained have not been satisfactory. Some of the best birds obtainable were purchased abroad and distributed among the principal stations along the coast. The most important of these points is Key West, where there are a large number of birds capable of keeping patrol vessels off Havana in prompt communication with the commander of the fleet; but up to the present time the fast yachts and torpedo boats appear to have been used exclusively in transmitting messages. It would be interesting to have a test made of this method of communication, as considerable sums are spent every year in America and abroad on perfecting and maintaining a system of carrier pigeons, and the present seems to be an excellent opportunity for testing their practical value. Three or four pigeons on each transport carrying the army to Santiago would have kept the military authorities in Washington fully informed of their progress.

Acetylene Exhibition at Berlin.

The acetylene exhibition at Berlin, which was originally planned for Cannstadt, near Stuttgart, took place at Berlin on the Kurfürstendamm from the 6th to the 20th of March, in connection with an acetylene conference. Acetylene generators were exhibited by thirty firms, but most of them were not shown in operation, owing to the strict regulations enforced by the police. The generators in action had each to be shown in a special compartment not accessible to the general public, behind a strong wall. This was not in itself calculated to inspire the citizens of Berlin with a very happy idea of the safety of the new illuminant. Progress could be recognized in the exhibits, but as yet there does not appear to be any special type which is the favorite. Acetylene purifiers proved to be necessary adjuncts. Among the impurities of acetylene less thought of in general is phosphureted hydrogen. In spite of purifying, the hall every evening was foggy with fine dust of the phosphoric acid. Next year the meeting will be held at Budapest.

The Czar Sends for the Builder of the "Oregon."

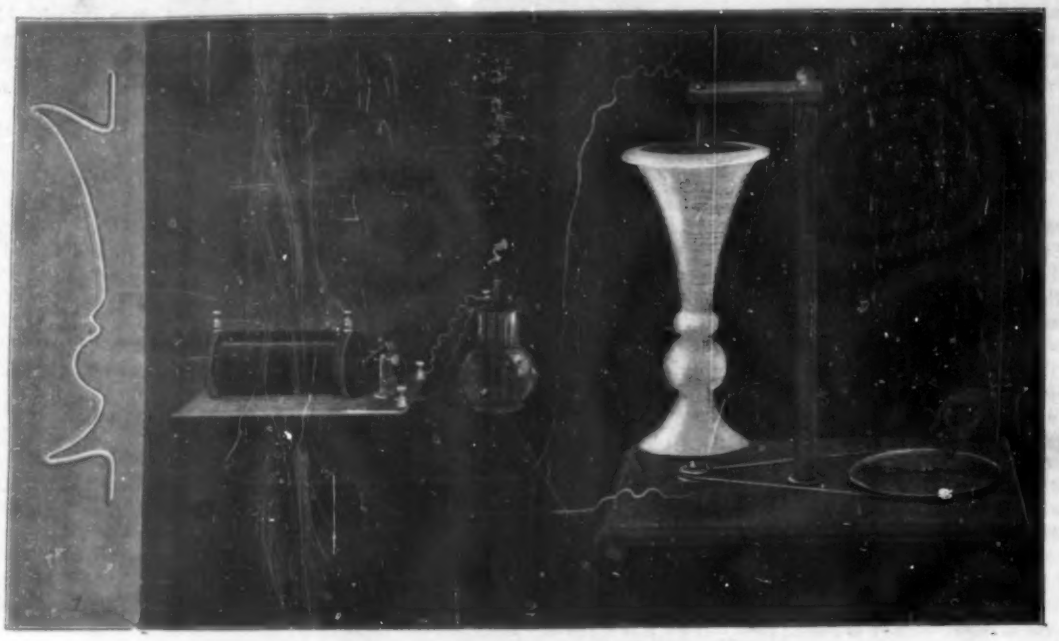
When the Russian naval authorities heard of the wonderful record made by the "Oregon" in proceeding from San Francisco to the coast of Florida in sixty-five days without an accident, they cabled Mr. Irving Scott, president of the Union Iron Works, of San Francisco, to come to St. Petersburg to arrange for building more vessels like the American battleship, which was the product of the Union Iron Works, of San Francisco. Mr. Scott has now sailed for Europe in answer to the invitation of the Imperial government.

A BEAUTIFUL EXPERIMENT.

BY H. B. DAILEY.

To the many amateur experimenters in static electricity who have been lured into this fascinating pastime by the excellent chapters in "Experimental Science" devoted to this branch of physics the following beautiful experiment would, in the opinion of the writer, prove of more than ordinary interest:

A piece of slender glass rod or tubing is bent in an alcohol flame into the shape shown in Fig. 1. By means of the arrangement in Fig. 2, the glass is supported so as to revolve freely in an upright position, its lower end resting loosely in a shallow hole in the wooden base of the instrument, while its upper end is held in like manner by the horizontal wooden arm at the top of the insulating standard, S. A small wooden pulley, P, cemented to the lower extremity of the glass and belted by means of a thread on to the hand wheel, W, furnishes a means of rapid rotation. Along the whole length of the glass is cemented by means of shellac a very narrow strip of tinfoil, which is divided at short intervals with the point of a penknife; the foil on the two straight extremities being left intact.



NOVEL ELECTRICAL EXPERIMENT.

The glass is set revolving and a current from an induction coil or influence machine is passed through the tinfoil, illuminating all the cut spaces. If the glass has been skillfully bent and the discharge is sufficiently rapid, the effect is one of startling beauty.

Persistence of vision transforms the revolving luminous glass into a perfectly symmetrical vase, glimmering, phantomlike, out of the darkness, and bedecked with thousands of jewels and flashes of shimmering light, having the appearance of the most delicately fashioned wire work, wrought in curves of sparkling fire. To insure the proper shape of the glass, a sketch of a vase of the desired form may be drawn upon a piece of smooth board and the glass made to conform with the outlines of one of its sides. The vase may be made 8 or 9 inches in height.

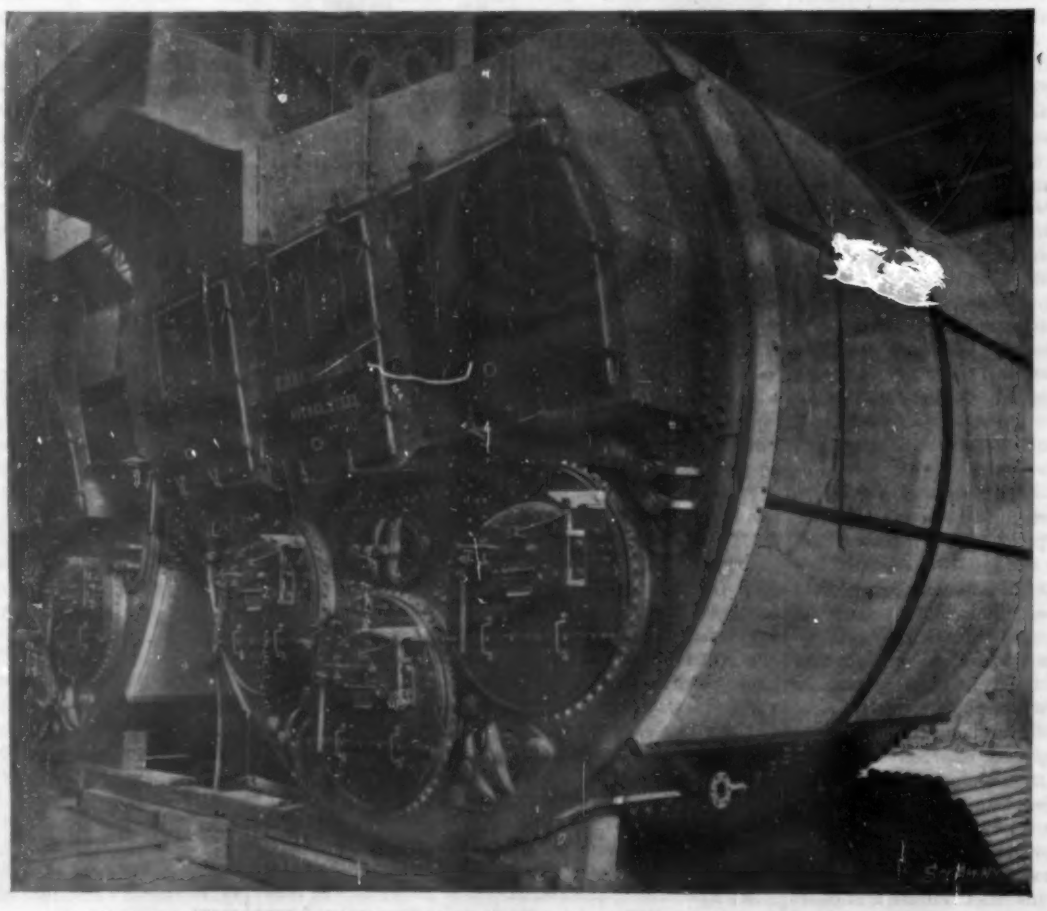
The ordinary spiral tube familiar to experimenters gives an exceedingly beautiful effect when revolved as above, the spiral being multiplied many times by persistence of vision.

THE BOILERS AND BULKHEAD DOORS OF THE "CHICAGO."

The unarmored cruiser "Chicago" of the United States navy was one of the original vessels of the famous "white squadron." She was launched in 1884, and on her trial trip she made 15 knots with 5,083 horse power. It was decided about three years ago to make many changes in the "Chicago," and these changes, which are almost completed, will convert her into a fast cruiser of 18½ knots, developing about 9,000 indicated horse power. New engines, of course, were required, and they were built at the Brooklyn Navy Yard, as well as the boilers shown in our engraving. The Bureau of Steam Engineering adopted a combination of the cylindrical Scotch boilers and the sectional type. The engine room is next the four Scotch boilers, then comes the blower room, then the six Babcock & Wilcox boilers. The "Chicago" will be worked under forced draught on the closed stokehold system when running at high speed. Our engraving shows a pair of the Scotch boilers, which are about 1,000 horse power each. They are placed athwartships, and our illustration supposes the visitor to be in the stokehold looking at one pair of boilers, while the other pair is at his back. The Scotch boilers all make use of a common stack, and at the level of the protective deck the stack is crossed by heavy armor bars which preserve the integrity of the protective deck.

The Scotch boilers were built at the Brooklyn Navy Yard and are made of nickel steel, the sheets being 1 1/16 inches thick and the heads ⅞ inch thick. The mean diameter is 13 feet 8½ inches and the length 10½ feet. The three corrugated furnaces are 3 feet 5 inches in diameter and are all fired from the same stokehold. The length of the grate is 6 feet 8 inches. The outside measurement of the 417 tubes is 2¼ inches, and they are of a thickness of No. 10 Birmingham wire gage. The heating surface of the tubes is 1,770 square feet; the heating surface of the furnace is 134 square feet, of the combustion chamber 166 square feet, and of the tube sheets 66 square feet. The total heating surface is 2,138¾ square feet. The grate surface is 68·33 square feet. The boilers are covered with magnesia covering. It is expected that the Scotch boilers will drive the ship at a speed of 13 nautical miles an hour, and with the water tube boilers it is expected that 18½ nautical miles an hour will be made. The six Babcock & Wilcox boilers have a total heating surface of 18,000 square feet and 360 square feet of grate surface, making the total heating surfaces foot up 26,550 square feet and the grate surfaces 633 square feet. The bunker capacity is 920 tons. The steam pressure is 180 pounds per square inch.

The twin screw engines are of the horizontal triple expansion type. The cylinders are 33⅛ inches, 50¼ inches and 76 inches, the stroke is 40 inches and the engines make 120 revolutions per minute.



A PAIR OF NICKEL STEEL SCOTCH BOILERS FOR THE RECONSTRUCTED CRUISER "CHICAGO."

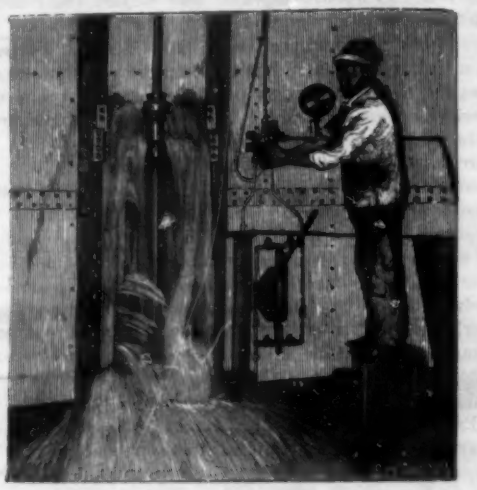
We now come to another interesting feature of the reconstructed vessel—the bulkhead doors. Lord Charles Beresford says: "It is a fact that upon the loyalty of the watertight doors, when closed, and upon the assurance that they are properly closed, depends the power of a battleship to float when wounded by ram, torpedo or a gun. It has been authoritatively stated that the cause of the loss of the 'Victoria' was that the watertight doors were not closed, and it has been constantly proved to be impossible to close watertight doors in an emergency, no matter how well disciplined and how gallant the ship's company may be. The system of closing the doors by evolution as to time invites an accident." Some very able experts contend that there should be no doors at all and that the main bulkheads should be intact to the main deck.

To the layman the number of bulkheads, doors, hatches and valves is extraordinary. Take the battleships "Indiana," "Massachusetts" or "Oregon," for instance; they have 272 watertight compartments, and the total number of watertight doors and hatches is 354. The number of valves for ventilating, draining and flooding hulls, including sea valves and pump suctions, and excluding all valves for motive power and auxiliaries, numbers 294, making a grand total of watertight doors, hatches and valves of 648. Valves are less important than doors and hatches, but when they guard a sluiceway, the passage of a ventilating pipe from one compartment to another, or a magazine flood cock, they involve the integrity of the ship in an emergency. It is hardly possible to exaggerate the sudden turmoil and shock of a collision in a seaway accompanied by fog and blackness, perhaps within as well as without the ship, the wild upheaval and stampede of being torpedoed, or the strain and jar of modern battle; and it requires about 110 men, excluding officers, to bring the cellular structure of the ship into operation when needed in the type of ship to which we have referred, so there is no wonder that ships go down when they have their skin punctured below the lower line, as for instance the "Vanguard," "Victoria," "Blanco Encalada," and "Elbe."

Many experiments have been tried and systems introduced for the instantaneous closing of all the bulkhead doors in an emergency. We present some engravings of one of the most successful solutions of this problem—the "long arm" system of Mr. W. B. Cowles of the construction department of the United States navy. The cruiser "Chicago" as reconstructed is provided with an installation of this system. Mr. Cowles considered that a practically perfect system would be to tie together in assorted bunches the widely distributed devices in a ship, by bringing the connecting strings from each device to a switchboard for each bunch and then assemble the switchboards into one or more central stations, from which each device can be controlled by an operator, independently, and to arrange the devices as they are needed to be operated in case of an emergency, so that this can be done with precision and full knowledge, from a point where the emergency can first be discovered. Arrangements should also be provided so that neither the emergency operation nor any other can harm the attendant or take control

out of his hands, and all watertight doors should be given an equal rank and precedence with the bulkhead of which when closed they form an integral part. The watertight doors should be capable of closing under head or rush of water, and every bunker door should be able to close through coal. A system of this kind, placing its sole manipulation in the hands of one man, is comparable to the switch and signal tower of a railway.

There are two general schemes in the Cowles long arm system—the double line and the single line. The double line is more complicated and efficient, involving an operator at the central station. The single line



BUNKER DOOR WITH CLEAR-WAY OPEN FOUR INCHES.

answers in many cases where control valves and telltales are not required at the central station. Our illustration shows the single line system as applied on the United States cruiser "Chicago."

The installation consists of eleven vertical sliding doors, all in the engine and boiler compartments, made of ¼-inch steel plates with vertical angle iron stiffeners and with manganese bronze plowshares to force its way through coal. The power cylinders for each door are made of seamless brass tubes. The system is operated by a steam accumulator and duplex pump of the Worthington type. They are placed under the protective deck. The hydraulic main is 2 inches in diameter, reduced in suitable steps. The emergency gear consists of a power cylinder with a 4-inch stroke operating the by-pass cock on the accumulator and a corresponding telltale and controlling valve in the conning tower, connected by a ⅛-inch pipe and forming a "primary circuit." This circuit consists of two cylinders with their pistons and piston rods connected by a double line of small piping. One cylinder, called the power cylinder, is connected with the device to be operated; the other cylinder, called the "telltale," is placed at the point where it is intended to operate the device. These two cylinders may be at any distance apart.

The double line of piping is so arranged that the pistons in the cylinders operate in exact accord. The power cylinder does the desired work, while the telltale cylinder reveals the position of the power cylinder and consequently that of the bulkhead door. At each door is a so-called "liberty valve," which can be started independently of the general system. Ingenious devices are provided to tighten the doors at side and bottom. One of our engravings shows the door under a head of water, with the tightening gear slacked up, and another, a bunker door, with all the tighteners in operation.

The side tighteners consist of traveling rollers held between a wedge track and a wedge bar, each of these latter being the full length of the door. The wedge track is secured permanently to the door, and the wedge bar rides with the door throughout its travel, except during the short tightening interval at the closing end of the stroke, within which the wedge bar is held stationary on the guide, thus causing relative movement between the wedge track and wedge bar on the rollers. This movement presses the wedge bar out against the guide lip, and the wedge track, with the door and seating strip, in against the seat.

The doors are of ¼-inch steel plate with 2½-inch by 2½-inch by ⅜-inch vertical steel angle stiffeners at side and with manganese bronze plowshare and top tightener castings stiffening, respectively, the bottom and top edges of plate; the seating strips at top and bottom are of steel ⅜ inch thick; the side seating strips, wedge tracks and wedge bars are of naval brass with Tobin bronze rollers 1½ inch diam. by 1½ inch long. The interlocking toes, pins, and rollers are of steel, with adjustable manganese bronze stop-plates and fish-plate brackets. The wedges set in the plowshare are of steel, removable, and all parts of the door are screwed together throughout in such a manner that corrosion cannot affect the screws and so that any part may be renewed without injuring any other part. It should be noticed that the side edges of the door, outside of the stiffening angles, are flexible. When the tightening gear is free the door has ⅛ inch play in its guides, both side-tips of toes is easily ground and pressed down, and falls to the floor between the webs and seat.

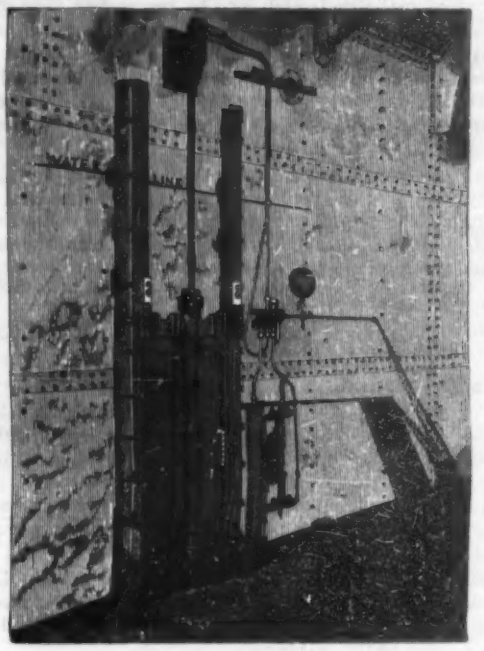
BUNKER DOOR UNDER HEAD OF WATER, WITH TIGHTENING GEAR SLACKED UP.

Care of the Wounded in Naval Warfare.

One of the most difficult problems to be faced, in the event of war, says The Medical Record, will be the care and treatment of the wounded in and after naval battles. That the decisive fighting will occur at sea is, in the opinion of most competent military experts, a foregone conclusion, and therefore every possible effort should be put forth to provide adequate accommodation and proper treatment for those who may be wounded. The fact that a battleship of the modern type is, even in time of peace, sadly lacking in the necessary facilities for caring for the sick is too well known to dwell upon, and it follows as a matter of course that these conditions will when war is in progress be sharply accentuated. In truth, the outlook as regards this phase of the situation is by no means pleasant to contemplate. Little is known of the effects of modern naval warfare on a large scale, but from the slight experience gained in the Chino-Japanese war it is certain that new methods of treating wounded men in action must be initiated, as well as of caring for them subsequently. In the days of wooden ships, those requiring surgical treatment were brought to the surgeon; in the modern man-of-war, divided into numerous compartments by steel decks and water-tight doors, such methods are impossible, and other means of succoring those in need of assistance must be devised by the surgeons. Again, the position of the surgeon will be one of much greater personal danger than was formerly the case; he will not be able to fix upon a particular spot where he can perform his necessary duties, but must be wholly guided by circumstances and must choose a sheltered place in the ship anywhere most convenient. His equipment and the means of transporting the wounded must be of the simplest.

But the question of how most efficiently to care for the wounded after the engagement is perhaps more important than during the action itself. It will be impossible to give them the needed care and treatment on the ship itself, and in many instances the distance from land will be too great for the service of a hospital to be available. It would appear therefore that an ambulance ship should satisfactorily supply this want. The suggestion that an ambulance ship should accompany every fleet on active service was first made by Dr. J. Rufus Tryon, formerly Surgeon-General of the Navy.

Dr. Van Reypen, the present Surgeon-General, read a paper strongly urging its adoption at the Moscow international medical congress, in which he submitted plans of such a ship. These are as follows: "The vessel as designed will be three thousand five hundred and fifty tons displacement; two hundred and seventy-five feet on the load line and three hundred feet over



BUNKER DOOR UNDER A HEAD OF WATER JUST BEFORE OPENING.

all; with twin screws and a speed of fourteen knots; fifty feet beam, and drawing eighteen feet; a coal capacity of four hundred and fifty tons, giving eighteen days' steaming at ten knots. The water tanks will hold nine thousand gallons. The ship will carry four steam launches and four barges, each barge arranged with a flying floor between the thwarts, so as conveniently to carry twelve cots on the floor. There will be beds for two hundred and seventy-four and hammock space for eighty-six, state-rooms for eight disabled officers and cot space for twelve. The forward ward on the upper deck has been left with only one tier of berths for a ward of isolation or to accommodate more serious cases. The vessel can comfortably accommodate three hundred and thirty sick or wounded men, with sufficient berthing space for the crew of the vessel. There are quarters for four medical men, two apothecaries, and twelve nurses. . . . Near the center of the ship on the berth deck is the operating room, eighteen by twenty-one feet. It is well lighted by a large skylight and by air ports above the deck. . . . As soon as the action is over, a launch should tow its barge alongside a vessel that has been in action, the wounded should be hoisted out and into the barge, and it should then steam away with all dispatch to the ambulance ship, unload its human freight, and speed away again on its mission of humanity."

The naval authorities have, it is announced, decided to act on this suggestion, and have purchased the Cromwell liner Creole, which is being as quickly as possible converted into a floating hospital in the Newport News shipyard. This vessel is intended to accompany the North Atlantic squadron now off Key West, and her speed will enable her to keep up with the fleet.

"VIVOS voco, mortuos plango." The great bell from which Schiller took his motto for the "Lied von der Glocke" will shortly belong to the voices of the past, says The Pall Mall Gazette. This is the bell of the Münster, at Schaffhausen. It was cast at Bâle in 1486, though in this century the families and guilds which supplied the great belfries of Europe were at Nuremberg, Augsburg, and in Holland, while the Klinge or Klinghe family in Northwest Germany gave their name to the domestic bell wherever the German language is spoken. The Glocke von Schaffhausen was originally a passing bell, and it has tolled its own passing for more than a century. A piece of the metal broke away more than a hundred years ago, and a new and dangerous crack was revealed last year. For the sake of its historic past it was treated with all possible care. It was covered up in winter and its voice was heard only on Sunday in summer. Now it is to be melted with the four other bells of the minster, and a new peal will take its place. Another historic bell in Switzerland is the silver bell in the minster at Berne. It rang "for the service of God, the festivals of state and the execution of the evildoer." When the forces of the young French republic captured Berne in 1798, the citizens painted it a funereal black, and under this disguise it escaped from the rapacity of the Gaul.

A By-product of Iron Making.

BY WILLIAM GILBERT IRWIN.

One of the most important recent products of this inventive age is the discovery of a method for the utilization of iron slag which has recently been made by a Chicago iron worker. The product of the new discovery is called carbolite. It is a combination of carbon, calcium, aluminum and silicon, and from it is produced ethylene gas, which is a great improvement over acetylene. It is now generally believed that the manufacture of carbolite, which is to be begun in a very short time, will revolutionize the manufacture of iron. The reduction of the slag into carbolite reduced the waste iron to the state of a by-product, from which ethylene gas can be produced at a cost 50 per cent under the cost of acetylene, and for all purposes the former is greatly superior.

The waste in the processes of iron manufacturing is enormous. For every ton of pig iron produced no less than 13,000 pounds of substance goes to waste. Using an ore containing 50 per cent of metallic iron, the waste and production would be about as follows:

Consumption.		Production.	
4,000 pounds iron ore.		2,000 pounds pig iron.	
1,100 "	limestone.	1,500 "	slag.
8,500 "	air.	12,100 "	gas.
15,600 "		15,600 "	

For every ton of pig iron obtained there is a waste in slag of three-quarters of a ton. This is not only a waste product, but its removal from the blast furnace is expensive, and this greatly increases the cost of producing the pig iron. While this slag product has in some cases been used to adulterate the cheaper grades of cement and to manufacture mineral wool, its use has as yet been exceedingly limited. Its principal use has been as railroad ballast and in steel working, but the income from these sources has scarcely justified the handling of the material.

In the newly discovered fuel process this slag is combined with carbonaceous material, such as coke, and thus the new product is obtained. In bringing carbolite into contact with water or other liquid, a gas is instantly generated which, when used in suitable burners, gives a beautiful white flame of great steadiness and remarkable luminosity. The processes of the production of this new fuel product are as follows: Slag being a combination of all the non-volatile substances contained in the charge except iron, and being lighter than smelted iron, floats on the top and is drawn off through an aperture in the furnace, placed at the upper line of the molten iron, into suitable receivers, so constructed as to contain a very great amount of heat. Being at a very high temperature, it is almost as fluid as water, and by means of great ladles, operated by hydraulic power, is passed from receivers into converters, similar to those used for the manufacture of Bessemer steel. Except that their tops are somewhat closed, the opening being much smaller than their central diameter, these converters may be likened to great elongated iron kettles, hung on iron shafts or trunnions leading to and connecting with a number of small tubes which perforate the bottom of the converter. These pipes are so arranged that finely crushed coke can be fed into and forced through them.

Before the slag is poured into the converter, a strong gas blast is forced through the pipes to keep the molten mass from running into and filling them up. As soon, however, as the slag is poured into the converter, the pulverized coke is fed into the pipes, and by the blast is carried through and forced into the molten mass. This is continued until the mass is thoroughly impregnated with coke. To insure a uniform mixture, the converter is tipped backward and forward as desired, thus increasing the agitation, and when the mixture is complete, the converter is turned on the shaft so as to cause the mass to flow between the series of carbon fans or electrodes, which serve to introduce a powerful electric current. Coke being an excellent conductor of electricity, while the slag is a resistant, the result is that the particles of slag, in connection with the particles of coke, form innumerable miniature electric arcs, producing an immense heat within the mixture. In the course of about twenty minutes the mass becomes so superheated that the slag is deoxidized and becomes fused with the coke. When this fusion is effected, the material is finished. It is then poured into moulds of any desired size or shape, and when cooled it is of a crystalline formation and has a metallic glitter. It is nearly twice as heavy as coal.

This product can be kept independently or transported without difficulty. Protected by wood-jacketed tin cans from water and air moisture, it can be kept as a common article of merchandise and supplied to the consumer with much less difficulty than ordinary illuminating oil. Each pound of good carbolite will produce five cubic feet of gas, and each cubic foot is equal to fifteen feet of ordinary coal or water gas. By a little calculation it will be readily seen that at $50 per ton, or 2½ cents per pound, 35 cents worth will produce as much light as one thousand feet of ordinary gas costing $1. The same amount of light produced by the 16 candle power electric lamps, at one cent per hour, would cost $2.

Carbolite is simple and inexpensive, and it is equally adapted to use in isolated places or to supply the largest cities. For individual use generators are built which operate automatically. When the lights are burning, the machine makes gas; when they are out, the machine and the consumption of carbolite stops. The generators are simple and inexpensive. Any ordinary person may operate and afford one. For automatic town plants the cost is many times less than those now in general use. The cost of piping is less and the maintenance of the plant is nominal. It is equally practicable to light individual blocks or buildings.

The construction of a carbolite plant is almost identical with that of the Bessemer portion of a steel plant. The converters handle three or more tons at a single charge. The production of carbolite under the most favorable circumstances will be in connection with the manufacture of pig iron or coke. In a combined plant not only can the slag of the blast furnace be utilized and made valuable, but the immense value of gases from the furnaces, converters and coke ovens, together with the now wasted sensible heat, could all be transformed into mechanical energy ample to provide power for all requirements without the expenditure of a penny for fuel.

It is estimated that a 150-ton a day carbolite plant will cost $150,000. The cost of operating the plant and producing the carbolite is estimated at $1.75 per ton. But placing the cost of the product at $10 per ton, and crediting to the blast furnace $8.25 of this amount for slag, waste gases and heat, the product is remarkably cheap. The annual output of such a plant would be 45,000 tons, and at this rate this product would represent a value of $450,000. The cost of packing the product, office expenses and depreciation of the plant could not exceed $150,000, which would leave a net profit of $300,000 annually. Through the adoption of this new process, which utilizes the waste products of iron manufacturing, the cost of pig iron will be reduced fully one-half. Based on the output of iron for 1897—being nearly 10,000,000 tons—it would mean a saving of upward of $40,000,000. The use of carbolite gas for heat and power purposes is unlimited, and this new product is almost certain to revolutionize many important manufacturing industries.

From the new product either heat or power can be produced at one-tenth the present cost. Alcohol or ether can be thus produced in quantity, and in the processes carbonic gas is obtained. The most modern use of the latter is in extinguishing fires on shipboard. It is produced in such quantities that it is confined in pipes, and, under pressure, it could easily be conveyed through buildings for fire-extinguishing purposes. It could likewise be used for refrigeration, and would thus do away with ice boxes. Houses could be cooled in the same way in which they are heated with steam. This latest product of electro-chemistry and electro-metallurgy, which is really a process for the utilization of the by-products of iron making, is destined to work wonders, and the near future is certain to see its further exploitation and development.

The New Transatlantic Mail Steamer "Kaiser Friedrich."

With the arrival at New York last week of the "Kaiser Friedrich," the latest addition to the magnificent fleet of the North German Lloyd Steamship Company, one more of the remarkable vessels which have made the transatlantic service the most distinguished in the world commences her active service between the new and the old world.

She is in many respects a sister ship of the "Kaiser Wilhelm der Grosse," which was fully illustrated and described in these columns at the time of her maiden voyage. (See SCIENTIFIC AMERICAN of June 19, 1897, and October 9, 1897.)

The new ship has a gross tonnage of 12,600 tons, with displacement of 17,000 tons on a draught of 28 feet. She is 600 feet long, or 40 feet less than the "Kaiser Wilhelm," 64 feet in beam, and 41 feet in moulded depth. Both the ships and the engines were built at the yard of Mr. F. Schichau, at Elbing. The engines are of the quadruple expansion type and consist of five cylinders acting on three cranks. High pressure cylinders are 43¼ inches in diameter, the intermediates 64¼ and 92½ inches respectively, and the two low pressure cylinders are each 93¼ inches in diameter. The indicated horse power is 25,000. The bronze propellers are three-bladed and 20 feet 4 inches in diameter. Nickel steel is used for the cranks and propeller shaft. With a view to reducing vibration, and incidentally assisting in the trimming of the vessel, the engines are located amidships, and not, as is usual in an ocean liner, in the after part of the vessel. As a result of this arrangement, it has been necessary to place one of the boiler compartments aft of the engine room. Steam is supplied by nine cylindrical double-ended boilers and one single-ended boiler, the whole being arranged in three groups, each in a separate watertight compartment. The total heating surface is 73,000 square feet. The working pressure is 225 pounds to the square inch, and Howden's system of forced draught is employed. As to the all-important question of speed, although the new ship did not distinguish herself from her maiden trip, falling considerably below the record of the "Kaiser Wilhelm," it is expected when her engines are settled down to work she will reduce existing records for the transatlantic trip about half a dozen hours. Some promise of this is given by the fact that on the run from Bremerhaven to Southampton she maintained an average speed of 21⅛ knots per hour.

Valuable Hints to Manufacturers and Exporters.

Commercial missions must bring large results to nations who take intelligent methods to ascertain the needs of the world's markets and adjust their manufactures to the demands of distant peoples. Our chambers of commerce, says the English Consular Journal, might have been much more active in this respect, and it is unfortunate for British trade that their inaction has not been shared by chambers in other countries. In order that we may enlarge our foreign trade, it is of the first importance that our manufacturers should know not only what suits British tastes and prejudices, but what our customers like and will have. Closely allied to the previous grounds of the success of foreign producers is the question of packing, as to which there is a general consensus of opinion that our foreign competitors, and in particular perhaps the United States, take much more trouble than we do. The following instance was recently cited: Hong-Kong—Candles. British makers absolutely decline to alter their system of packing to that adopted by Continental markets; consequently, they have lost the whole trade. The personal factors which enter into successful competition must not be ignored. It is important that our manufacturers of textile fabrics should know what are the desires or prejudices of purchasers in the different markets of the world, as regards quality, weight, sizing, dressing and the finish which will often sell low-priced goods; preferred lengths and widths; and the manner of putting up and packing, freight charges, etc. An unfortunate trade mark will often doom an otherwise desirable product to failure. This is particularly true in China.

Mr. Gardner, the British consul at Amoy, reporting on this subject last autumn, said: "It has not unfrequently occurred that the sale of foreign goods has been greatly crippled by having some label placed upon it that was offensive to Chinese superstition or tastes. Many colors have peculiar recognition by the people; some offend their tastes and others their superstitions. Some are all right on some kinds of goods and all wrong on others. The Chinese will often buy biscuits, needles, thread, matches, soap, medicine, scent, sweets, etc., for the sake of getting a lucky label. Some colors and combinations of colors are to the Chinese unlucky." Mr. Gardner at the same time furnished us with some four hundred designs for trade marks and labels which, in his judgment, would be popular with the Chinese people. Many of these designs we have already discussed, and we are now in receipt of further important particulars from a consul in China.

It must be remembered that Chinese art is very peculiar, and a tiger as ordinarily represented by foreign artists would not meet with favor with these people. It must be a tiger according to Chinese imagination and art, of unreasonable length of body or bigness of head or curve of tail, and impossible attitudes. On a popular Japanese match box is displayed a monkey standing on its front feet, head nearly touching the ground, with hind feet up in the air, and tail whipping the skies. The grotesque, and even hideous to the British mind, tickles the fancy of the dwellers in Far Cathay. No description can supply adequate information to an engraver or colorer by which he could produce the real thing, and any departure from the Chinese fancy in such things would brand the goods at once as the product of a "foreign devil," and doom it to defeat. A Chinese dragon differs from a Japanese dragon in its contortions. A royal dragon must have five claws, while the plebeian beast has only four. A stork must always stand on one leg, or, flying, must present an enormous spread of wings and trailing long legs. All Japanese birds, when flying, must have a tendency downward, never up or on a straight course. To a Japanese nothing is preferable to the representation of snow-capped, sacred Fusiyama, as seen on nearly all Japanese fans, screens, etc.

Statistics as to Bombardments.

The editor of Le Journal des Débats, of Paris, has collected some official statistics to prove that a bombardment is not such a terrible thing after all. In 1870-71 the bombardment of Belfort lasted seventy-three days, during which 99,453 projectiles fell within the city and there were but sixty victims killed or fatally wounded. At Strasburg, during the siege of thirty-eight days, the Germans fired upon the city, mostly at close range, 193,722 shells, with a record of only 300 victims. Finally, at Paris, where the bombardment lasted only twenty-three days, 10,000 siege shells were thrown, killing and wounding 107 persons.

RECENTLY PATENTED INVENTIONS.

Bicycle Improvements.

TIRE.—Herman A. Fonteine, Auburn, N. Y. The improvement of this inventor consists in providing a wheel-rim with a number of pneumatic bulbs projecting outwardly, the bulbs being in communication with one another, so that they may be simultaneously inflated and deflated. The bulbs are independently movable, so that if one of them should be punctured, it can be removed and fitted with an interior skin or film of fabric. It can then be replaced and the series of bulbs may be again inflated by the usual means.

BICYCLE.—Albert S. Weaver, Hamilton, Canada. The purpose of this invention is to provide a bicycle which is arranged for carrying a number of persons, the seats for whom are mounted in pairs, one behind the other. Each person has a separate pedaling device and is enabled to steer the bicycle. The bicycle is provided with a front frame extending transversely and having side arms and top and bottom cross-arms connecting the side arms. A center brace is located between and parallel with the side arms and connects the top and bottom cross-arms. A brace connects the center-brace with the upper part of the steering head for the front wheel. Braces connect the steering head with the bottom cross-arm at each side of the center brace. A saddle and pedaling device are carried at each side of the frame. Saddles and pedaling devices are also carried in front of the bicycle and over the rear wheel.

Mechanical Devices.

VOTING MACHINE.—Andrew H. Hart, Winchester, Ky. This voting machine comprises a case, a delivery-roller and a take-up roller mounted in the case and a numbered tape extending between the rollers. A block is movable in a slot in the top of the case, and a dog is mounted to swing on the block. When the voter has finished voting, the election officer pushes the block forward so as to impart motion to the take-up roller, moving the tape through the space from one numeral to another, the numerals indicating the total number of votes registered. The dog mentioned is adapted to engage with ratchet teeth formed in a flange of the take-up roller. From the block, a resilient detent-strip extends and has a hook end, a rod over which the hook is designed to engage and means for lifting the detent from the rod. This mechanism is all controlled by the block. The detent prevents the voter from voting twice and also prevents repeating.

GRAIN-SEPARATOR.—Jacob F. Koch, New Athens, Ill. This invention consists chiefly of a straw-conveying mechanism elevated over the separating pans to carry the straw bodily clear of the pans and independently of chaff and grain. The apparatus is provided with a thrashing cylinder and concave. A vibrating separating pan is located below the cylinder and concave, the separating pan receiving the straw and grain from the cylinder and concave. A vibrating lifting rack is located in the rear of the point on the separating pan, which point first receives the straw and grain, and serves to raise the straw and other coarse material from the separating pan. An elevated straw carrier is located over the separating-pan and receives the straw from the lifting-rack.

ARTIFICIAL FLOWER CRIMPING MACHINE.—Lucien Ebert, New York city. This machine for crimping and goffering fabric-blanks is provided with a fixed bar, a pivoted bar adapted to swing toward and from the fixed bar to hold the blanks between the bars, and heads mounted to slide on the bars to press the blanks endwise. Means are provided for imparting a swinging motion to the pivoted bar and an adjusting device regulates the position of the movable bar relatively to the fixed bar.

STREET-SWEEPER.—Alvin Brown, Aurora, Ill. The street-sweeper of this inventor is provided with a casing and an endless traveling brush-belt running on front and rear sprocket wheels. The shaft of the front wheels projects through the slotted sides of the casing. Frame-bars extend along the sides of the casing and have a lengthwise slot. Brackets are connected with the shaft ends and have a projecting portion or rib that slides in the slots of the bars. A screw-bolt works horizontally in a threaded lug on the bars and is connected with the bracket for adjusting the brush higher or lower. An inclined pan or chute is arranged beneath the brush and receives the dust or dirt. Means are provided for adjusting the pan to the brush.

POTATO-PLANTER.—John A. Cooper, Summit, Ia. This potato-planter, designed to distribute seeds automatically and to plant one or two rows, is provided with a hopper around which a seed-receiving receptacle revolves. Stationary strippers are carried by the receptacle and pickers also carried by the receptacle have movement to and from the strippers. Means are provided for operating the strippers so that the tines of the pickers may pick up the seed potatoes from the bottom of the receiver. The seed receptacle is provided with openings between the sections at which the strippers and pickers are located. Platforms adjustably supported from the hopper control the distribution of the seed and levers are connected to the platforms to raise and lower them. Cleaning-blades have vertical movement in the bottom of the seed-receptacle and travel on an undulating track.

Engineering Appliances.

STEAM BOILER AND FURNACE.—William Hopkins, Dubuque, Ia. The boiler of this inventor is provided with tubular fire-chambers, each having an annular water space extending throughout the length of the furnace and connecting the water-space near each end of the furnace, and boiler with the shell of the latter, so as to insure a rapid, continuous water-circulation. The tubular fire-chamber or furnace is provided with a corrugated interior cylindrical fire wall, held concentric within the exterior shell of the furnace, thereby affording an annular water-space around the fire-wall, which is to be branch-connected by thimbles or like means, with the water space in the boiler to establish free water-circulation between the water-holding compartment of the furnace and the water-space of the boiler. Means are provided for raising the temperature of the water before entering the boiler.

BOILER.—Benjamin P. Emery, Kennebunk, Me. This boiler is provided with a fire-box surrounded by a water-jacket. A casing incloses the upper portion of the fire-box and the boiler is located in the upper portion of the casing. A coil of pipe extends around the sides of the fire-box and around its rear end and communicates with the water-jacket. Stand-pipes are located at each side of the fire-box and extend upwardly to and communicate with the boiler. The stand pipes also communicate with the water-jacket, and coils of pipe are located between the boiler and the fire-box, and also between the stand pipes, the coils communicating with the water-jacket and with the boiler.

MOTOR.—Francis A. Brennan, Brockville, Canada. The motor of this inventor consists principally of a hollow cone, connected with the crank arm of the main shaft, a cone of flexible material and united at its base with the base of the hollow cone, and a fixed connection with the apex of the flexible cone for the inlet and exhaust of the motive agent to and from the cones.

Miscellaneous Inventions.

RAILWAY-RAIL TIE.—Edward R. Stiles, Decatur, Ill. The purpose of this invention is to provide a rail which will not creep, and to provide a bed for the rail which is designed to deaden the sound. The blocks upon which the rails rest fit into a channel-bar, each block having the lower portion of its outer end inclined upwardly and outwardly and its inner end inclined from top to bottom. Shoes are secured on the channel bar and have an inclined face resting against the outer inclined portion of the block. Bolts extend through the blocks and bottom of the channel-bar.

WIRE-FENCING TOOL.—James R Smith, Jefferson, Ala. This wire tool has a staff and two plates respectively engaging opposite edges of the staff, each plate having a hook thereon. The hook of one plate has a recess therein capable of receiving the wire and of holding the wire to permit its stretching. The other hook is capable of receiving the wire so as to handle it.

CUTTER AND HOLDER FOR FRUIT AND FLOWERS.—William W. Crockett, Falls City, Neb. This invention consists principally of a pair of jaws adapted to be moved toward and from each other, and a cutter on one of the jaws having its edge operating in conjunction with the top edge of the other jaw to cut the stem of the fruit, flower or like article before clamping it upon further closing the jaws.

ORGAN.—John E. Davis, Washington, N. J. The purpose of the inventor is to provide means whereby a proper actuating of the swells, mutes, couplers and like parts is obtained without binding and undue friction of the moving parts caused by lateral motion and shrinkage. The organ is provided with a lever formed with a pivot portion and arms extending therefrom and at angles to one another. One of the arms has a bent portion extending parallel and in alignment with the pivot portion and arranged for connection with the actuating part. The other arm is formed with a bend by which it is brought in line with the center of the pivot portion, the latter arm being arranged for connection with the part to be actuated.

GARMENT HANGER.—Thomas G. Owen, Newport, R. I. This garment-hanger has a body to which a bracket is fixed and is provided with a forwardly projecting hook. The bracket also has a forwardly and upwardly projecting hook. Both hooks are adapted to carry garments, and the forwardly and upwardly projecting hook is provided with a wall inclined toward the body, so that a cleat may be forced between the body and the wall.

DISH-DRAINER.—Marie L. Perrottet, New York city. With this apparatus, a simple method is provided not only for draining dishes, but for holding them in such position as to prevent them from becoming injured by falling on one another. Folding shelves are also provided for the drainer which are adapted to receive knives, forks and small dishes. These shelves may be carried close to the body of the drainer when the apparatus is not in use, thus permitting it to be stored in a small space. The shelves are so constructed that anyone of them may be folded upon the body of the drainer out of the way. The drippings are conducted to a reservoir forming part of the device.

LOCK.—Georges L. E. Pétorin, San Francisco, Cal. The purpose of this inventor is to provide a lock which may be cheaply manufactured. The lock comprises a double throw-bolt and a pivoted and spring-pressed locking yoke. One portion of the yoke body has an interlocking engagement with the bolt and the other portion extends to within a short distance of the key-hole. The key engages the yoke to free the bolt and then the bolt so as to throw it.

BAG-CLOSURE.—Archia L. Ross, New York city. This inventor has provided a bag to be used for receiving ashes, papers and refuse, which may be easily suspended, held open and hermetically closed. The bag-closure comprises a frame having two spring-metal members pivotally connected with each other. One member is provided near its middle with a pivoted loop and the other with a transversely extending catch having a shoulder adapted to snap under the other frame member, between the members of the loop, to lock them and keep the frame in closed position. A cord packing is arranged on the inside of the frame and follows the line of the members thereof, so that when the bag is closed the packing hermetically seals the mouth of the bag.

CALL-BOX SYSTEM.—Edgar E. Salisbury and Albert E. Dean, Tacoma, Wash. These inventors have provided a call-box system in which telephones are used, which makes use of a permanently magnetized circuit but employing no local battery. The purpose of the invention is to cut the primary circuit of a coil within which the transmitter is located, in and out of the main-line circuit, when either in use or not in use without disturbing the secondary which is the local circuit. Means are also provided whereby the hanging up of the receiver indicates that the subscriber has finished his conversation.

BOOKBINDING.—Joshua R. Wales, Marlborough, Mass. In this invention, a strip of fabric constituting the back-binding has transversely separated portions or tongues which are secured on the covers and body of the book. Tapes are arranged within the binding, are passed through longitudinal slits in the tongues and are glued down on the tongues.

BARRICADE ALARM FOR DOORS.—George D. Winters, Reno, Nev. The alarm of this inventor is of such nature that when a door is partially opened the alarm will be immediately sounded when set. The alarm is provided with a strut-bar having at its upper end a sliding connection with the door and an alarm mechanism supported on the door and including a trip-bar arranged for operation by the upper end of the strut bar.

EGG-CARRIER.—Charles Goetz, Viola, Idaho. This carrier is composed of a cruciform base, four vertical posts set in the end portions thereof encircled by coiled springs, and a horizontal platform having holes to receive the posts and provided with a large central opening for the reception and support of an egg-basket, the upper portions of the posts projecting a considerable distance above the platform.

GATE-HINGE.—John R. Haldeman, Springfield, Mo. The gate forming the subject of this invention is constructed in the usual manner and is supported and slides on flanged rollers which are journaled on the face of a vertical bar pivoted to a post. The arrangement of the pivots whereby the bar is attached to the post prevents the bar from swinging by mere friction of the gate-bars with the rollers, as the gate is slid back and forth.

RAILWAY SIGNALING AND SWITCHING APPARATUS.—John D. Taylor, Chillicothe, O. The purpose of this invention is to construct an interlocking or controlling apparatus having means for preventing a lever changing its position in either direction before the track-switch has made its complete movement. The signal-operating mechanism is provided with two semaphores or signals. A reversible electric motor operates the signals and a clutch mechanism on the shaft of the motor selects either one or the other signal, depending on the direction of rotation of the motor. A polarized pole-changing relay determines the direction of the current through the motor-armature. A two-position circuit closer is attached to each of the two signal operating levers, one for each signal. These circuit closers act conjointly to control the circuit through the polarized relay and severally to control circuits through the motor. A generator and electrical connections are also provided. The switching apparatus comprises a series of operating levers, primary and secondary locking bars, connections between the primary bars and levers, yielding connections between the primary and secondary bars, holding latches for the secondary bars and electrical means for releasing the latches.

MOP-WRINGER FOR PAILS.—Frank Trimble, Greensburg, Ind. The mop provided for by this inventor may be conveniently wrung without the use of the hands. The mop-wringing attachment comprises a section arranged for attachment to a pail, and a pivoted section, both sections being provided with rollers at their inner edges. Means for locking the two sections together when the mop is to be drawn from the pail are provided.

GRAIN-SPOUT.—Albert D. Bellinger, West Superior, Wis. The purpose of this invention is to provide an easily manipulated spout which can direct grain to any part of a boat and which may be quickly lengthened and shortened at will. The spout comprises two telescopic sections. One of these sections is longitudinally slotted at the top and adapted to slide on the other section. An arm extends from the lower end of the upper section through the slot. Means are provided for moving the movable section on the other section.

COMPOSITION FOR REMOVING BOILER INCRUSTATIONS.—George Linde, Omaha, Neb. This composition, designed to remove the scales in boilers consists of gallic powder, sal-ammoniac, soda, salt, acetic acid, catechu and Irish moss. It is claimed that a small quantity of the composition introduced from time to time suffices to keep the boiler completely free of all incrustations.

CARRIAGE-STEP.—William F. Hopkins, Caruthersville, Mo. The object of this inventor is to provide a carriage step which will readily turn to one side or move upward when coming in contact with or passing over a stump or other obstruction. The step is provided with a fixed rod having a lateral projection. A shank is formed with two downwardly inclined cam surfaces approaching each other at their adjacent ends. The shank is mounted to slide and turn on the rod with the cam-surfaces above the projection and in engagement with it. By this means the shank will be rotated with longitudinal movement. A foot-piece is attached to the shank to press the latter against the projection.

Designs.

PIPE.—Julius Becker, New York city. This design consists in forming the stem so as to simulate the appearance of a war-vessel. The bowl rests upon the war-vessel and the mouthpiece is a continuation of the vessel.

BOTTLE.—George Miller, Jersey City, N. J. The leading feature of this design consists in forming the upper part of the body of a bottle like a dome. A base and a tapered longitudinally-paneled section between the dome and the base complete the design.

CREAM-SEPARATOR.—Arthur C. Webber, Knowlesville, N. Y. This design consists in a box, approximately rectangular in shape, and having a hopper-shaped bottom inclined longitudinally and in an upward direction from the front end of the box to the rear end. The box is mounted on legs and has a cover at the top.

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(7454) H M. P. says: 1. In the table of United States ordnance, at the end of the NAVAL SUPPLEMENT, I notice that, in the first column, it says, for example: "6 in. B. L. R. Mark III, of 40 calibers." Will you please explain to me, either by letter or in the "Notes and Queries" of the SCIENTIFIC AMERICAN, what "Mark III" and also "of 40 calibers" mean, and why the different "Marks" and "calibers" change the dimensions of the gun? I do not suppose that the "of 40 calibers" is the length of the gun, for in the column of lengths, the length of this gun is given as 21·3 feet, which is longer than 40 calibers. A. "Mark III" refers to a shop mark, which distinguishes a particular kind of gun of the same caliber. "40 calibers" means forty times the caliber of the gun, but this again has some latitude, as, in some cases, the length of the gun is meant, while in other cases the length of the bore only is considered. 2. Will you also give me the dimensions and other particulars concerning the Canet 6 inch gun, of 40 calibers? A. The Canet 16-centimeter gun (6·30-inch) of 60 calibers, is 31½ feet long, weighs 8·56 tons; the projectile weighs 101·4 lb., the muzzle velocity is 2,953 foot-seconds; the muzzle energy is 6·188 foot-tons; perforation through wrought iron at the muzzle is 25·3.

We are glad to note the interest which our NAVY SUPPLEMENT has awakened, and we trust before long to issue a special number, dealing with ordnance and armor, including powders.

(7455) C. W. C. asks: What is the voltage and amperage of an ordinary 6 by 8 telegraph battery or gravity cell? A. The voltage of a gravity cell is 1 volt. Its internal resistance under mean working conditions is 0·5 ohm. Its maximum current in short circuit is the quotient of the volts by the ohms, or 2 amperes. It should not deliver this amount for any length of time. In the telegraph, the external resistance is large, and the current used is a very small fraction of an ampere.

(7456) T. H. S. writes: I am thinking of building a frame cottage and covering the outside with pressed metal shingles, roof and sides. I would like to know if this makes a hotter house than simple frame sheathing. A. The chances of a colder house in winter would seem to be greater than of a hotter house in summer. By using proper sheathing paper and having ample dead air space between outside and inside walls, the house may be made as comfortable as any house. 2. What would be the danger from lightning in such a dwelling, if the metal sides had proper connection with ground? I presume it would be more likely to be struck than frame, but would it not be practically absolutely safe to the inmates? A. The metal covering properly grounded, and numerous wire points from ridge, gables and chimneys will render it safe from lightning. You will need no separate lightning rods.

TO INVENTORS.

An experience of fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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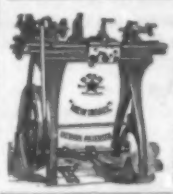

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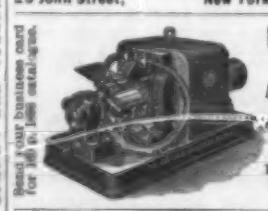

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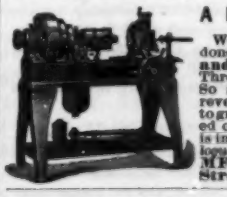

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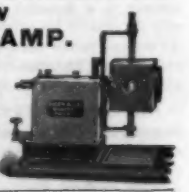

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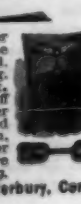

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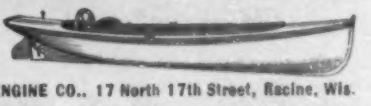

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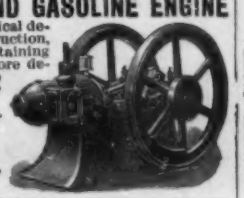

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PERFORATED ZINC FOR CLEANING OF GRAIN &C
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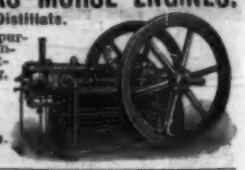

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